



TRANSFORMING MATH THROUGH
CAREER-CONNECTED LEARNING

**WE GUARANTEE MATH
IMPROVEMENT FOR
YOUR STUDENTS**

WELCOME FROM NS4ED

NS4ed has developed an evidence-based math curriculum to increase student engagement in learning and raise their proficiency in math. The curriculum, Pathway2Careers™, includes more than 650 authentic careers as the backdrop for learning math concepts and skills—presented as real-life problems. THE RESULT? Learning becomes more relevant to students, each student determines the career framework in which they want to learn math, and no student is left behind. This is “career-connected learning” it is motivating students to learn, and we guarantee its success!

The pandemic’s impact on education has been deeply felt across schools nationwide. Student learning losses in mathematics alone are staggering, particularly for minority groups where losses are up to one year. This places a double burden on teachers as they help students who have fallen far behind while also teaching grade-level skills and concepts.

A survey conducted by the Global Strategy Group and released in April 2023 found most Americans are unhappy with the math taught in classrooms. Parents and teachers want “a more engaging set of math curricula with up-to-date lessons that are relevant and applicable to the real world.” Most parents agreed the changes would help their kids succeed, including preparing them for careers. Most respondents agree that children who excel in math are more likely to succeed later in life.

The Pathway2Careers career readiness model addresses all these concerns and delivers, with a guarantee:

- A solid foundation of best practices: The platform, software, and applications represent educational initiatives built upon actionable research, policy, and evidence-based practices.
- Career exploration to engage and motivate students to learn.
- Ready-engaged and motivated students, who can now learn important math skills in Pre-Algebra, Algebra I, Algebra II, and Geometry.
- An extensive menu of onsite and web-based training and coaching support that is innovative and forward-thinking. The math skills and core concepts being taught are the same; the method for engaging students in the subject matter has changed. This is NS4ed’s model for professional development.

We welcome your interest in becoming part of our solution.

Sincerely,



Dr. Joseph L. Goins, Chief Executive Officer

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We GUARANTEE improved student outcomes or your money back. You will find no other partner so sure of its products to be willing to make this promise.





SECTION 1. THE NS4ED GUARANTEE

The NS4ed Pathway2Careers (P2C) platform, an exciting new learning model in education, blends together career exploration and development with mastery of mathematical concepts and skills. The curricular content was developed to help students be cognizant of the relevance of math to their everyday lives.

P2C’s exceptional approach to improving math scores for all students is on the cutting edge of what educational leaders and schools aspire to as they prepare students for next steps following graduation.

“This is where I see education going in the future. I see a convergence of pre-K-12, higher education, and industry all coming together,” stated Pedro Martinez, CEO (Superintendent) of the Chicago Public Schools in a recent interview.

We at NS4ed believe all students can learn math. When P2C and accompanying professional development are implemented with fidelity, we guarantee success. We are so sure of the impact of our program that we are offering you a money-back guarantee if results fall short by the end of the school year.

1.1 THE RESULTS UNDERLYING OUR GUARANTEE

NS4ed believes in its product—so much so we can confidently offer a guarantee of improved math proficiencies and improved engagement in the learning process. We do this because we know P2C works. And, we have the results to back up our confidence and stand behind the Guarantee.

1.1.1 The University of Louisville Evaluation Study

In 2022, the Center for Research in Mathematics and Science Teacher Development (CRIMSTED) of the University of

OUR GUARANTEE:
In just one year, students will show increased engagement in learning and increased math scores. Plus, they will chart their own futures!



Students will finally get the answer to the age-old question:
“WHEN WILL I EVER USE THIS?”
And with this answer, they will look at math differently and become part of the learning process as they chart their own futures!

Louisville conducted a thorough evaluation of the P2C curricula from a systemic approach that considered student and teacher experiences with detailed metrics. P2C is the first-of-its-kind comprehensive mathematics curricula with a career-centered learning lens.

CRIMSTED’s scholarly team (comprising Dr. Thomas R. Tretter, Professor and Science Education Co-Director of CRIMSTED; Dr. Katherine Marin, Assistant Professor of Math Education; and Ph.D. candidate Stephanie White) applied a three-fold evaluation approach to analyze course application, explore lesson content, and examine the courses holistically. Evaluation results identified four notable curriculum strengths across each of the course curriculum. These were: breadth of career integration; rich array of career connections of high interest; incorporation of comprehensive mathematical ideas; and systemic integration of engaging mathematical representations.

Study results also confirmed the systematic integration of multiple mathematical representations—equations, graphs, images, drawings, words, tables, and coordinate systems—and effective navigational guidance for students. Conclusions stated P2C is likely to be helpful for students to cognitively strengthen their understanding of connections among mathematical ideas and between mathematics and other domains such as science, art, and communications. According to Dr. Tretter, Lead Researcher, “... P2C makes for a powerful way to think about learning mathematics.”

1.1.2 APEX Evaluation

APEX is a national consulting and technology services company specializing in systems evaluation for more than two decades. In summer 2022, an independent evaluation of P2C by APEX examined the teacher/student user experience and satisfaction; and the relationship between student use of the curricula related to students’ career awareness, mathematical performance, and learner attitudes toward mathematics that use a unique career lens. The APEX evaluation reported teacher focus groups had positive feedback on the curriculum. Short-term student outcomes showed:

- Pathway2Careers has the capacity to interest students in math by using career exploration examples.
- Students are engaged, stay engaged, and enjoy learning math through career examples.
- Curricular content exposes students to a broad and diverse range of potential careers; the curriculum helps students gain occupational insight beyond local community jobs; and with this insight, students better understand how they need math.

1.1.3 Student and Teacher Surveys

NS4ed compiled results from student and teacher surveys over the past four years to determine program effectiveness through outcomes in student engagement and math proficiencies (NS4ed, 2023). Survey questions pertained to the use of the curriculum in teaching and learning, and how its use affected student attitudes and understanding. The surveys included 525 students and teachers who used P2C, broken down to 11% 7th grade; 38% 8th grade; 32% 9th grade; 17% 10th grade, and 2% 11th grade.

Aggregated findings show positive outcomes and growth, as follows:

- The majority of students reported greater interest in learning how math is used in different careers, and greater interest in learning math.

- Teachers reported P2C was effective in building student engagement in learning; helping students better understand math concepts; and helping students understand how math skills are relevant to careers.
- Teachers reported P2C made math concepts easier to teach as well as learn as a result of their relevance to students’ lives and futures.
- The majority of teachers reported P2C helps reduce learning loss in math, as evidenced through higher test scores and proficiency measures (where available).

1.1.4 Tennessee Department of Education

As part of its rigorous quality instructional review, the Tennessee Textbook and Instructional Materials Quality Commission and the TN Department of Education approved NS4ed’s Pathway2Careers™ mathematics curriculum for use in Tennessee schools across the State.

1.1.5 New Mexico Public Education Department State Assessments

Implemented since 2020 in New Mexico, NS4ed’s P2C has yielded positive results with students in Algebra I and Geometry. Usage continues to grow across the state.

COURSE	NUMBER OF STUDENTS	STATE PASS RATE	PATHWAY2CAREERS PASS RATE
ALGEBRA I	1,184	76.3%	86.94%
GEOMETRY	987	79.45%	88.65%

The Public Education Department in New Mexico also reported:

- 95% of students said they enjoyed completing the Pathway2Careers math lessons.
- 96% of teachers reported students were engaged and enjoyed the math lessons, including Pre-Algebra, financial literacy, Algebra 1, Geometry, and Algebra 2.
- 83% of teachers reported an increased interest in career exploration and learning math as a result of using the Pathway2Careers curriculum.
- 92% of teachers also reported an observable increase in math performance among students.

1.1.5 Teacher Focus Group Comments

Apart from the quantitative outcomes above that show P2C works to improve student math proficiency and engagement, the qualitative assessments from what teachers say further supports our guarantee.

“Never in my 20 years of educational experience have my students ever experienced such in-depth career-focused math problems.”

“P2C curriculum is extremely unique; it lifts the veil, and perfectly focuses the spotlight on the type of math used in any chosen profession.”

“With the Pathways2Careers lessons, I saw more of my students take risks and engage in conversation during the lessons which helped our class build more community and self-confidence.”

“Many of the teachers that I work with absolutely love the way their students glow and marvel at grasping concepts that otherwise they very well may not have understood.”

“Students love to see what they have learned in math going to be used in real life.”

“The careers were good because they were often careers students have not heard about, previously. It was nice for them to understand that there are so many specialties that they can explore...”

“The lessons are more visual than other curricula, which provide some students a better way to understand.”

“Since the entire P2C curriculum is directly aligned with different careers, it helped my students see that there is a point to what they are learning. Last year, the number one question I got was how they would use this math in the real world...this question was not a problem to answer this year!”

1.1.6 Video Career Stories and Interviews

NS4ed has recorded 300 personal narratives from diverse perspectives and brought these real-world working men and women right into algebra and geometry. In the videos, these employees explain the paths they took to become anything from an architect to an actuary or a bio-informatics scientist to a chemical engineer or a welder.

Plumbing and mechanical systems inspector Jothum Stallings recounts as a high-school student being “on the verge of dropping out” how career-connected learning and the promise of solutions saved him. In the video, he excitedly describes his first meeting with the plumber. That one interview inspired an at-risk young man to become excited over plumbing, over the potential for having a good job, and to find purpose in learning.

A video of a teacher in New Mexico was full of enthusiasm about how exciting it was to see her students excited. As she noted, “Once they got to researching careers, they were hooked. I mean all of my kids. I mean the reluctant learners, my high achievers, and my kids on IEPs for gifted and for learning disabilities. I don’t know if I’ve ever seen them that engaged for that long. And the conversations I’ve been hearing them have about it have been really cool, especially with my freshman. I mean they are seeing opportunities now they opened their minds to it”

1.2 BACKING UP THE GUARANTEE VIA A SCHOOL/NS4ED PARTNERSHIP

Throughout implementation, NS4ed will work closely with your math teachers, department heads, and school leaders in a collaborative partnership to:

- **CONSULT AND PREPARE**

NS4ed will work with each school to conduct assessments that identify a school’s unique needs so we can customize our partnership to those needs. Based on these needs, NS4ed will offer design expertise and support for best practices and define the terms of the guarantee.

- **IMPLEMENT AND TRAIN**

NS4ed will deliver the P2C platform and offer all required training materials. Options might include Algebra I for incoming 9th grade high-school students, or Geometry or Algebra II for those incoming students who completed Algebra I in 8th grade. NS4ed will ensure all courses meet state requirements. Because P2C course content and skill development is vertically aligned, students can take the time they need to achieve mastery in their course (e.g., some 9th grade students may need more than just one year to master Algebra I).

- **PROFESSIONAL DEVELOPMENT**

NS4ed will provide a complete and comprehensive program of customized professional development that includes implementation training, onsite coaching, and onsite and web-based workshops on best practices in career-connected learning. Professional learning communities will be developed around P2C and career-connected learning best practices.

- **ASSESSMENT AND SHOWCASE**

NS4ed will help schools establish assessment and reporting systems which support continuous improvement. Together, these results will be shared, based on details outlined in the initial consultation to showcase student growth and engagement.

1.3 MOTIVATING, ENGAGING, AND LEARNING

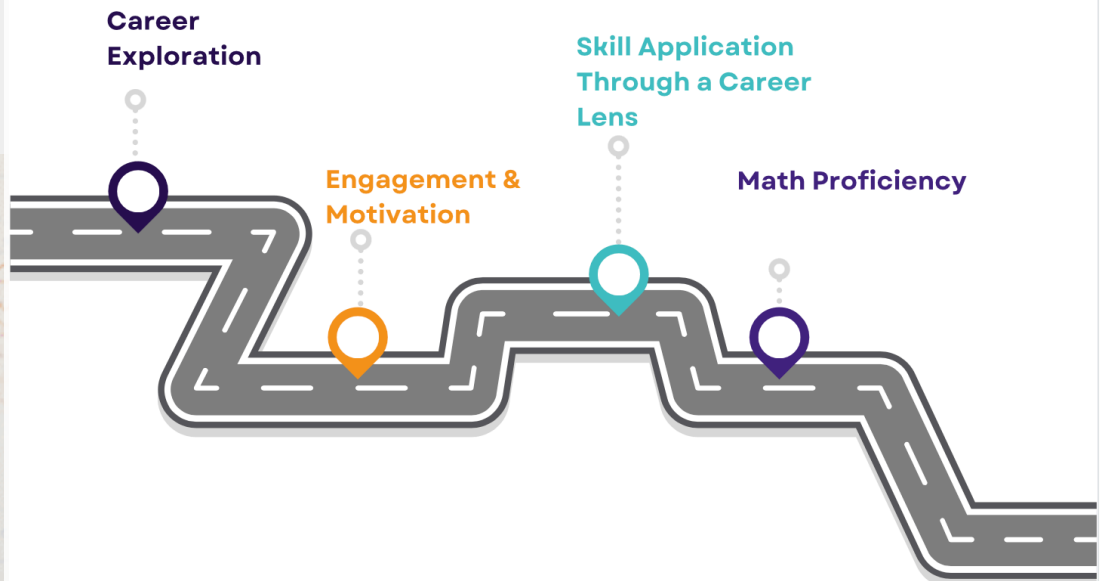
NS4ed developed P2C from the company-wide vision that every student can learn when what they are being taught has a purpose and relevance to their lives. To this end, P2C leads students along robust, career-connected pathways from middle school to high school to postsecondary education and training, and to the workplace. The result is a pipeline of diverse, well-skilled talent for local employers and the regional economy. We guarantee success in your schools.



SECTION 2. THE PATHWAY2CAREERS UNDERLYING FOUNDATION

2.1 HOW IT WORKS

P2C is a model of career-connected learning. In this model, career exploration becomes the framework for building motivation and engagement in students that will make learning easier. Within this framework students will engage in application lessons of traditional math concepts and skills to gain math proficiency:



“It’s time we bridge the divide between our K-12 systems and our college, career, and industry preparation programs, which leave too many students behind and perpetuate inequities in our most diverse, underserved, and rural communities,” said the U.S. Secretary of Education Miguel Cardona.

“America is home to some of the world’s brightest and most ambitious students, and we owe it to them to set them up for success,” said U.S. Secretary of Commerce Gina Raimondo. *“Career-connected education programs are essential to the success of the American economy.”*

What these agencies express is precisely the work NS4ed has advanced in states across the country for many years. NS4ed has blazed the trail for holistic, integrated career-connected learning:

NS4ed alone has answered the question students have asked for years, “When am I ever going to use this?” With the answer, they are motivated to learn.

NS4ed’s comprehensive approach to career-connected learning aims to deeply engage students in their own learning processes. By connecting teaching and learning to the real-world, students develop a stronger interest in the content. When students are provided with tools to make learning relevant and applicable to themselves, their performance and interest increase. Demonstrating connectivity between lessons and real-life situations is a game-changer, helping students understand how the math concepts align within career pathways and destinations.

2.1.1 Reimagining Schools

P2C is a career-connected math program. Its basic theory is that students will be able to connect and engage with challenging mathematics concepts by learning about and thinking critically about potential careers. When students connect with a specific career path and goal through career exploration, they will be motivated to persist and continue with mathematics at progressively higher levels, as they prepare for an increasingly digital workforce.

NS4ed developed Pathway2Careers with the belief that every student can do great things when encouraged to discover their future pathways through career exploration, and then learn academic skills vital to success in the careers they are exploring. In this way, students can, on their own, connect careers and learning.

Education’s entire approach to readiness—for both the college and career-bound students—is changing as we embrace innovative school models that redefine what post-secondary pathways can look like. For students heading for college, the aim is to provide them with the skills they need to reach their post-secondary goals. For students entering the workforce, the aim is to ensure they have the critical skill set, required training, and necessary credentials. For all students, a firm math foundation to support their career choices is a key step toward meeting their goals.

2.1.2 Closing the Engagement Gap

The engagement gap starts in middle school. While 80% of elementary students say they are engaged in their schoolwork, less than half remain engaged into high school. Perhaps that’s why 80% of students today report being bored or disinterested in school and why high school dropout rates are increasing post-pandemic.

The National Dropout Prevention Center at Clemson University conducted one of the largest studies of its kind to determine the root causes of dropouts and what can be done to change them. When students are at-risk in public schools, academic support becomes the primary focus. Yet, the Clemson study shows that providing such academic support increases student motivation by just 11%. Conversely, focusing on career development and job training has been shown to increase motivation by 81%.

P2C’s succeeds in “making math meaningful” by highlighting high-value careers as the framework in its lessons and demonstrating to learners how math is vital in those jobs. To ensure relevance, NS4ed’s math curricula use current, state-specific career data from the U.S. Bureau of Labor Statistics. By integrating math learning with data-based career exploration, NS4ed has achieved two milestones in education:

- Helping students learn math, the most important STEM skill for the workplace.
- Creating a platform that listens to student career aspirations, and helps them build the pathways to move toward success.

2.1.3 Purpose in Learning

P2C’s math curricula and career exploration platform are based on two fundamental approaches to help build student competencies. The first approach is grounded in giving students purpose and choice in their learning

process. The second approach gives students interest and motivation to learn. As students gain skills and confidence, they begin to envision careers that in the past may have seemed unreachable to them. Operating with these approaches, NS4ed's curricula and platform provide students with choice, purpose, and exposure to careers in order to build their competencies in math.

2.1.4 Equity in Education

NS4ed provides a more equitable approach to learning math by making career exploration, which is embedded in the math curriculum and provided as a stand-alone course, the innovative driver for building the foundational interest, engagement, and motivation that will teach all students how to learn math. Careers are of utmost importance, including for those students who often fall through the cracks. Therefore, careers are used to engage students in math learning, which is a primary skill for today's workforce.

When looking at equity, a good example can be the composition of Algebra I courses. In Algebra I, some of the students will continue in CTE, and some will continue in general education. The important point is they all are being given the opportunity to become motivated and engaged through purpose, so they can now learn math through the lens of jobs and careers. No one is left behind when the learning is relevant and inclusive.

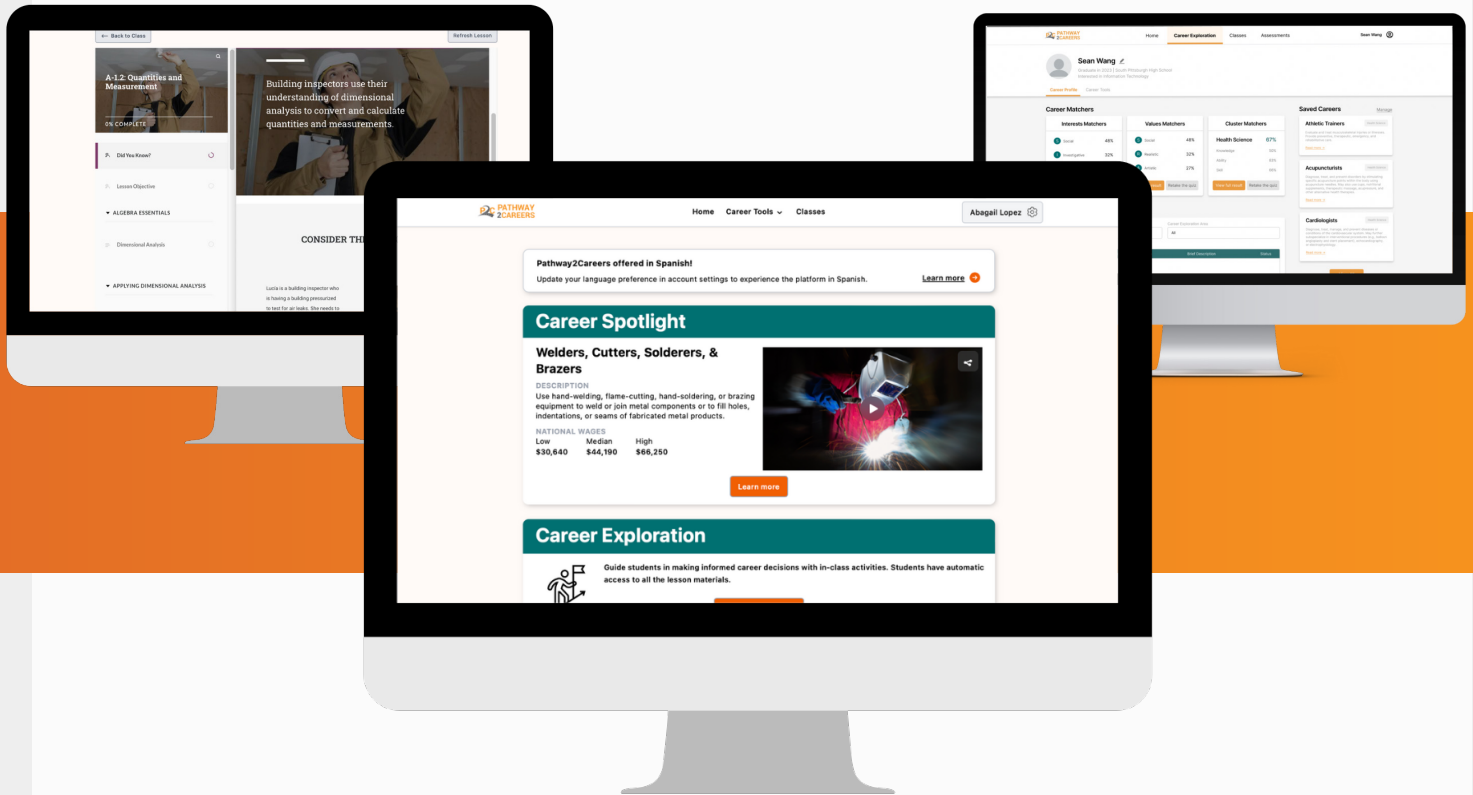
2.1.5 Education with Distinction

P2C is an education with distinction model of career-focused learning, which distinguishes the curricula from other math curricula on the market today. NS4ed encourages the use of informed career readiness practices in educational settings so learning is not taught in “silos” apart from real-world applications, or in single-targeted student populations such as with gaming applications.

P2C is unique in that it merges up-to-date career guidance with academic learning. Unlike textbooks, Pathway2Careers can add, modify, or enhance lessons to reflect changing demands of a region’s economy using real-time labor market information. This gives P2C fluidity not available elsewhere.

It’s a question older than $A^2 + B^2 = C^2$...

“When am I ever going to use this?”





SECTION 3. THE PATHWAY2CAREERS PLATFORM

3.1 PATHWAY2CAREERS CAREER EXPLORATION

3.1.1 Career Exploration Curriculum

The P2C Student Career Exploration platform is the first guided, cross-subject curriculum for grades 6-12 in the nation, delivering age-appropriate (scaffolded) learning objectives to provide a connected and cohesive career exploration program. Career exploration exposes students to job functions, industries, and careers to help them determine interest areas and align their academic course choices with career pathways. Career exploration takes students on a journey of personal discovery, career awareness, and career evaluations. This is the first step to engage and motivate students so they can learn math and build math proficiencies.

The platform includes career assessments for students to examine potential career clusters based on their interests and curates their journey on a platform they can carry on their way to high school graduation. Aligned to the US Department of Labor’s National Career Clusters Framework, students can explore careers in the 16 industry clusters and 79 unique career pathways. By helping more students discover their potential, we can produce powerful outcomes. P2C Career Exploration includes:

- Career exploration learning involves personal discovery, career evaluation, career preparation, and career awareness.
- Learning aligned to the 16 career clusters from the National Career Clusters Framework.
- STEM Career activities and financial literacy learning curriculum.



“

Never in my 20 years of educational experience have my students experienced such in-depth career-focused math problems.

- Multiple subject integration with dual learning objectives.
- Career assessments provide students with work interests and work value scores.
- Career pathways guide students to high-value careers in their region.
- Personalized portfolios foster growth and create opportunities to connect with real-world opportunities.

3.2 PATHWAY2CAREERS MATH CURRICULA

3.2.1 Overview

P2C covers four full years of math instruction: four vertically aligned courses—Pre-Algebra, Algebra I, Geometry, and Algebra II. Learning and teaching are reinforced through automated assessments and new teaching materials for each course. Professional development ensures that assessment translates to continuous math improvement.

The web-based math lessons for Pre-Algebra, Algebra I, Geometry, and Algebra II are available both online in an interactive program and in PDF form for those who prefer to print the lessons. Collectively, the P2C math curriculum includes:

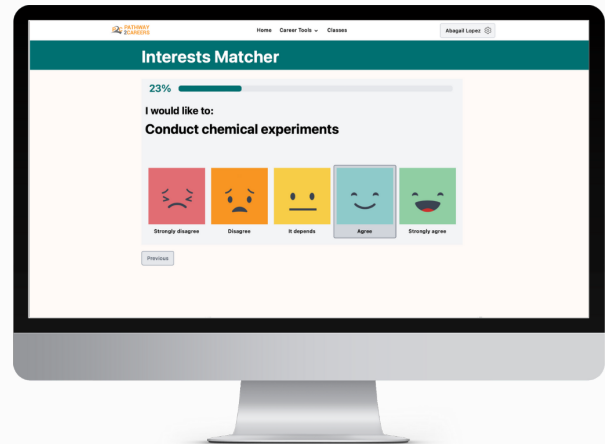
- More than 534 lessons introducing students to more than 650 unique occupations.
- Occupations representing high-value careers in multiple fields.
- Application lessons offering in-depth exploration of specific math concepts in the context of a spotlighted career.
- Use in a blended learning model as a core or supplemental curriculum.

- Digital curriculum integrated with numerous labor market systems.
- Alignment with common core state standards and various state-specific academic standards.

3.2.2 Self-knowledge, learning style, interests, aptitudes, and careers

At the beginning of each math lesson, students take an **interest survey** that helps them identify personal work-related interests. Responses from the interest survey also help the Pathway2Career curricular software drive the career context of the lesson.

Profiler responses are grouped into six different interest areas. Students explore their strongest areas and learn how specific interests align with particular careers. These are the first steps of career exploration.



After completing the self-assessments and learning about how different interest areas support career interests, students are introduced to the 16 career clusters within the National Career Clusters Framework developed by the US Department of Labor. These include:

With knowledge of their interest areas, abilities, and values, students select a career cluster that best fits their personal interests. Thereafter, each lesson focuses on one cluster, and content will be presented in the context of a specific cluster-

related occupation, constantly presenting students with unique occupations. Occupations selected to represent each of the clusters are carefully researched by a labor market analyst to ensure they portray viable career opportunities for students.

As students work through the math lessons in Pathway2Careers, they continue to gain self-knowledge as they explore their learning styles, personal strengths, interests, and aptitudes. This growth is supported and encouraged through a unique career exploration curriculum (described above) developed by NS4ed and delivered in conjunction with the Pathway2Careers math curricula for middle and high school. Teachers can structure the career exploration and math lessons as independent studies by each student, or as large or small group collaboration with other students.

3.2.3 Lessons



Agriculture, Food & Natural Resources



Architecture & Construction



Arts, Audio/Video Technology & Communications



Business Management & Administration



Education & Training



Finance



Government & Public Administration



Health Science



Hospitality & Tourism



Human Services



Information Technology



Law, Public Safety, Corrections & Security



Manufacturing



Marketing



Science, Technology, Engineering & Mathematics



Transportation, Distribution & Logistics

P2C provides students with two types of lessons that intertwine math and careers.

Exploration lessons demonstrate the skills. They instruct students on the structure of mathematics through notes and examples. These lessons indicate multiple examples of occupations that utilize the math skills and concepts taught in the lesson. Each lesson includes a minimum of two real-world (workplace-based) problems that ask students to demonstrate how certain occupations use the mathematical concepts of the lesson.

- Application lessons spotlight one high-value occupational connection to the math concepts taught in the lesson. In these lessons, students receive details about the occupation (a description, what people in that career do on the job, salary ranges, demand projections, and accompanying employer videos that “put a face” to the job) and the role math plays. Students gain a deeper understanding of the connection between the occupation and the concept as they become engaged in the learning process.

Each lesson begins with a career spotlight on the occupation that will illustrate that lesson. The career spotlight provides students with the occupation description, the differing levels of education required, potential employers, and a summary of responses to the question, “Is this a good career for me?”

Also in the introduction is a list of the math concepts that will be taught. Lesson objectives are stated, along with illustrations of the math problem, again in context of the student-selected occupations. For example, if a lesson is focused on solving problems with angles, it may be taught in the context of an occupation as a carpenter. The lesson shows what carpenters need to know, which courses would be helpful, and how this math is used on the job. Lessons will also include hints for planning how to solve the presented work problem. A series of problems at the end of the lesson determine skill growth and understanding of the math concept taught.

Lesson content is organized around unique career-focused sections: Career Spotlight, Step into the Career, On the Job, Career Spotlight, and Practice and Check.


- Career Spotlight sections are found on the first page of every application lesson. It includes a description of the occupation and its educational requirements. Short videos can be accessed of employees in the job discussing their workday and responsibilities. Job demand and salary projections are also included.


Each lesson builds on prior learning by describing the prerequisite learning requirements in the teacher's editions. The application lessons are also an extension of prior learning. After the first page of career data, the opening section addresses the prerequisite skills related to the spotlighted occupation.

- On the Job sections present at least four problems directly related to skills and situations that could be found in a particular career. Students must consider the occupation and the application of the mathematical concepts presented in the lesson to solve the problems. These problems often revisit the original question posed at the beginning of the lesson.
- In every Pathway2Careers lesson, Practice Problems allow students to demonstrate their proficiency in the skills taught throughout the lesson. These problems include special headings (Error Analysis, Writing, Technology, Challenge, etc.) that develop critical thinking skills and require deeper levels of understanding. Students also develop critical thinking skills through real-world application problems (problem-based learning) in every lesson.

LESSON 2.7

Solving Literal Equations and Formulas





Encourage your students to learn more about this occupation and many more in the Pathway2Careers Career Library.

CAREER SPOTLIGHT: Electrician


Electricians use math and science in making sure that they have the correct equipment and meet specifications. They must make sure that electrical wiring, equipment, and fixtures meet safety codes. They need to be knowledgeable about various testing tools and measuring devices.

- Discuss with students the kind of work electricians do by reading the Career Spotlight together.
- Find local vocational schools and colleges with an electrical training program to share with students.
- Research local companies that employ electricians or independent contractors, and ask what electricians do.

Video: Electricians
Have students watch this video, which describes the types of projects electricians might work on.

Lesson Objective
In this lesson, you will look at how equations and unit analysis can help an electrician in everyday work and business tasks.

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The curricula align fully with most state standards, and with CCSS standards for Math and crosswalks program alignments. Pre-Algebra thoroughly covers 94% of the 8th grade CCSS standards. Algebra I, Geometry, and Algebra II cover 100% of the High School CCSS standards. Tables of contents and pacing guides for all courses list standards for each section.

3.2.4 Application Lessons

NS4ed helps build foundations for math improvement and solutions for learning loss. The following **application lesson** illustrates the P2C math model. The example is for a career in carpentry. In an application lesson, students step into the career that is highlighted. The software gives the student career information about working as a carpenter, a video on what a carpenter does, and geometry concepts used in carpentry. Within the lesson, students are given “On the Job” experience to understand what type of work they’d experience in this career. The idea in the application lesson is to immerse the students in a career, engage them in learning the skills they need, and help them understand just how important mathematics is to any job.

In the following examples, on the left is what the students would see; on the right is a Teacher’s edition to guide teaching and learning:

LESSON 2.8

Use Theorems About Angles

CAREER SPOTLIGHT: Carpenter

Occupation Description
Carpenters construct, repair, and install building frameworks and structures made from wood and other materials.

Carpenters have many different tasks. Some carpenters insulate office buildings; others install drywall or kitchen cabinets in homes. Still others focus on production or commercial work to help construct tall buildings or bridges. These carpenters also erect shoring and scaffolding for buildings.

Education
Carpenters typically need a high school diploma and learn on the job or through apprenticeships. Certain high school courses, such as mathematics and mechanical drawing, may be useful. Some vocational-technical schools offer associate’s degrees in carpentry. The programs vary in length and teach basics and specialties in carpentry.

Potential Employers
The largest employers of carpenters are as follows:

Self-employed workers	27%
Residential building construction	22%
Nonresidential building construction	13%
Building finishing contractors	12%
Foundation, structure, and building exterior contractors	10%

Watch a video about carpenters:
<https://cdn.careeronestop.org/OccVids/OccupationVideos/47-2031.00.mp4>

Career Cluster
Architecture & Construction

Career Pathway
Construction

Career Outlook

- Salary Projections:
Low-End Salary, \$30,170
Median Salary, \$48,330
High-End Salary, \$84,690
- Jobs in 2018: 1,006,500
- Job Projections for 2028:
1,086,600 (increase of 8%)

Geometry Concept

- Apply theorems about angles.

Is this a good career for me?
Carpenters:

- Follow blueprints and building plans to meet the needs of clients.
- Measure, cut, and shape wood, plastic, and other materials.
- Construct and install building frameworks, including walls, floors, and doorframes.
- Instruct and direct laborers and other construction helpers.
- Install structures and fixtures, such as windows and molding.
- Inspect and replace damaged framework or other structures and fixtures.

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LESSON 2.8

Use Theorems About Angles

Encourage your students to learn more about this occupation and many more in the Pathway2Careers Career Library.

CAREER SPOTLIGHT: Carpenter

Carpenters use science and math with a focus on constructing, repairing, and installing building frameworks and structures made from wood and other materials. Carpenters use measurements and angles to make sure that components of a structure fit together correctly to ensure a sturdy structure.

- Discuss carpentry with students by reading the Career Spotlight together.
- Find local colleges and vocational technical schools with carpentry programs to share with students.
- Research local companies that employ carpenters and ask what they do for the companies.

Video: Carpenter
Have students watch this video, which describes the types of projects a carpenter might work on.

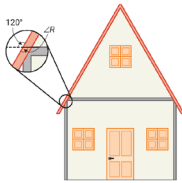
Lesson Objective
In this lesson, you will look at how a carpenter applies theorems about angles to carpentry tasks such as framing buildings and building furniture.

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5. A carpenter needs rafter ties to frame a very steep roof. The outside line of the roof makes a 120° angle with a horizontal line. What is the measure of $\angle R$?

QUICK TIP

Rafter ties are horizontal pieces that connect two sides of a roof.



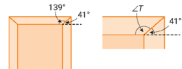
Devise a Plan

Step 1: Determine the relationship between the 120° angle and $\angle R$.

Step 2: ?

Step 3: ?

6. A carpenter needs to replace the trim above a doorway where the top trim and the side trim are different widths. The angles measured are shown.



- What is the relationship between the 139° angle and the 41° angle shown on the left?
- What is the relationship between the 41° angle and $\angle T$ shown on the right?
- What relationship can you find between the 139° angle and $\angle T$?
- What is $m\angle T$?

On the Job: Apply The Vertical Angles Theorem

Answers

2a. no

2b. 53°

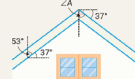
2c. The apprentice used the measure of the complement of the given angle.

Use these questions to check students' understanding.

- In 2a, how did you check whether the 32° would work for the box?
- In 2b, how did you determine the correct angle for the notch?
- In 2c, what is the relationship between a 56° angle and a 32° angle?

3 Step into the Career: Congruent Complements Theorem

A carpenter is framing the roof of a house where the pitch of the roof is 37° , as shown. What angle measure should be used for $\angle A$?



Students may not be familiar with the pitch of a roof, which is a measure of the steepness of the roof. The pitch of a roof can be given as an angle from the horizontal, as done here, or as a ratio of the vertical rise of the roof to the horizontal distance spanned. Here, an angle of 37° corresponds to a ratio that is about 9:12, which means that the roof would rise 9 feet for every 12 feet of horizontal distance.

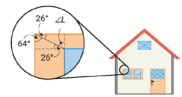
Guiding Questions

- In Step 1, how can a relationship between the 37° angle and the 53° angle be determined?
- In Step 2, what information shows the relationship between the 37° angle and $\angle A$?

DIFFERENTIATION: ENRICHMENT Different pitches of roofs are used in different circumstances depending on many factors, including the type of building (commercial buildings often have roofs that are less steep) and the environment (roofs of houses in colder places are often steeper so that snow does not build up). Ask students to think of other factors that could affect the desired pitch of a roof. (Possible answer: other environmental factors such as rain, wind, and surrounding foliage; type of roofing materials; cost of materials.)

Career Spotlight: Check

7. A carpenter is working on a house. For the shutters on the lower window, the side frame needs to be wider than the top frame so that the shutters can be supported by the side frame.

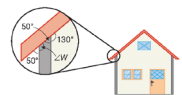


Select the answer from each box that makes the sentence true.

The 26° angle and the 64° angle are
 a. supplementary angles
 b. complementary angles
 c. a linear pair
 $\angle L$ and the

26° angle are
 a. supplementary angles
 b. complementary angles
 c. a linear pair
 The measure of $\angle L$ is
 a. 26°
 b. 64°
 c. 116°

8. A carpenter is working on a house. The roof and the outer walls meet to form several angles.



What is $m\angle W$, and what theorem could you use to determine this?

- $m\angle W = 50^\circ$, Congruent Supplements Theorem
- $m\angle W = 130^\circ$, Congruent Complements Theorem
- $m\angle W = 50^\circ$, Congruent Complements Theorem
- $m\angle W = 130^\circ$, Congruent Supplements Theorem

Exercise 6

Answers

6a. The angles are supplementary angles.

6b. The angles are supplementary angles.

6c. Both the 139° angle and $\angle T$ are supplements to a 41° angle. By the Congruent Supplements Theorem, they are congruent.

6d. 139°

Solution Steps

- The angle labeled 139° and the angle labeled 41° on the left are supplementary angles.
- The angle labeled 41° and $\angle T$ on the right are supplementary angles.
- Angles that are supplementary to the same angle are congruent.
- $\angle T$ is congruent to the 139° angle, so the measure of $\angle T$ is 139° .

Career Spotlight: Check

Tips for Completing Exercises 7–11

These tips will help students in solving these exercises and similar assessment items.

Exercise 7

Answer

7. b. complementary angles, b. complementary angles, b. 64°

Tip Encourage students to check their answers for reasonableness by reading the entire problem after they have chosen their answers. For example, since the sum of the measures of complementary angles is 90° , the number selected for the third blank cannot be greater than 90° .

Exercise 8

Answer

8. D

Tip Encourage students to examine the answer choices after reading the problem to eliminate choices that can easily be identified as incorrect. For example, the measures of both complementary angles must be less than 90° , so choice B can be eliminated.

Exercise 9

Answer

9. c, e

Tip Encourage students to determine and find the information that is needed to select the true statements. For example, students should determine the relationship between the angle labeled 78° and $\angle D$ in order to select the correct value for $m\angle D$.

3.2.5 Project-based learning Pathway2Careers is fully embedded with project-based learning experiences. NS4ed works closely with community partners to develop relevant projects in both middle-school and high-school lessons. These projects, in the form of summative assessments and aligned with the math lessons, provide an authentic scenario through the lens of various occupations. Then, students use their developed math skills and understanding to solve the problem. Projects are continually developed for each course and include broad industry PBL experiences or rather

an in-depth look at a specific career pathway within a specific industry (For example, the Logistics/Transportation industry could include variations in aviation, trucking, and shipping.)

3.2.6 Lesson-embedded Assessments

The P2C platform offers a unique Quantile measure that indicates the skills and concepts students are ready to learn. This information allows teachers to more easily align instruction and educational materials with a student's current skill level. The assessments support tracking of a student's mathematics growth with multiple evaluations conducted throughout the year. In addition to the Quantile assessments, P2C gives users access to a career database with hundreds of Quantile-measured occupations. Using their Quantile measure, students can review occupations for which they are mathematically prepared to access. 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.

NS4ed is the only curriculum in the country that utilizes the Quantile Framework for Math; produces Quantile-aligned assessments for growth tracking; and aligns Quantile scores to careers; and offers a career-connected math curriculum.

3.2.7 Support for Special Education

P2C math courses were designed to be responsive to students of differing abilities and learning styles. Much of the program is self-driven. Students take career interest inventories prior to beginning lesson blocks so the computer can generate the math lessons taught in the context of the career cluster the students chose. The emphasis in P2C is on student knowledge of core concepts. This design flexibility in the curricula enables students receiving special education services to participate at their own interest level and skill level.

The Quantile inventory embedded in P2C measures a student's readiness to move to the next lesson. If a student needs more time with a particular skill or concept in mathematics, the system will automatically generate new lessons to engage the student in learning, again demonstrating its ability to be responsive to students of all learning capabilities. This design allows teachers to easily align instruction with students' current skill levels.

3.3 PATHWAY2CAREERS PROFESSIONAL DEVELOPMENT

One of the keys to your success and our Guarantee is the NS4ed Professional Development Program. The fidelity of your implementation within our recommended guidelines can make the difference between modest gains and remarkable success for students.

For many educators, teaching math and recapturing lost math skills through a career focus is a novel way to teach. Through the workshops and available coaching programs, teachers become pioneers in this curriculum model, who work from a solid understanding of how algebraic and geometric concepts are used in different careers. During initial three-day training workshops for all staff implementing NS4ed, teachers learn to:

- Create collaborative student-centered classrooms where small group learning engages all students in problem-solving.

- Develop effective scaffolding and extension questioning strategies to keep students on track.
- Integrate technology effectively into the instructional process to individuate learning and enhance understanding.
- Use multiple measures to assess student knowledge and use those assessments to direct instruction.

Initial training also familiarizes teachers with data-driven instruction. The many assessments available through P2C—beginning, middle, and end of the year assessments—ensure proper pacing toward mastery. These resources, along with the trained facilitation in student discussions and presentations, will help teachers monitor what students know and apply.

After the initial three-day training, additional job-embedded professional development integrates and reinforces teacher learning. Entire math departments participate in an ongoing professional growth experience that takes place—either formally or informally; in discussions with students, peer coaches, or mentors; as part of a study group; through designated learning communities; or as participants in action research.

NS4ed Steps to Build Teacher Capacity

Step #1

Train all participating staff to work with the P2C platform and collaborative instructional methods.

Step #2

Work with teachers in ongoing job-embedded professional development.

Step #3

Establish online learning communities for teachers and school leaders, with one-on-one coaching sessions outside the classroom as needed.

Step #4

Help teachers effectively utilize course-based assessment tools to determine students' skill growth.

Step #5

For teachers who need more support, provide additional coaching, in the classroom.



SECTION 4. THE NS4ED GUARANTEE: SIMPLE RESPONSIBILITIES

4.1 CLASSROOM DELIVERY OPTIONS

The P2C digital curriculum provides teachers with flexible delivery options to connect careers to math learning and demonstrate how mathematical concepts relate to real-world occupations. Teachers can select between sharing PDF lessons and using the complete digital platform, which is accessible in the computer lab, annotated over a Smart Board and shared in a traditional classroom, or available on a student's laptop. The Algebra or Geometry lessons can be employed as a core curriculum, or educators can blend and select lessons/units for supplemental material.

4.2 HOW YOU KNOW IT'S WORKING

Within the P2C platform, students take summative assessments at the end of each lesson to track their progress in math and identify any math concepts which pose challenges. Along with these embedded assessments in the P2C platform, teachers will conduct multiple math engagement surveys to track the projected growth of student engagement—in math and in the school.

NS4ed uses continuous data trails to establish next steps in instruction and professional development. To ensure your implementation is personalized to your needs, NS4ed works closely with schools to develop report structures which are meaningful for a school's metrics, e.g., demographic reports to chart progress for any subgroup of students.

Every nine weeks—in September, December, March, and June—NS4ed will formally sit down with your math department to review student progress. Meetings can include all staff and/or be scheduled with individual teachers. The results of these meetings are consensus on next steps for continuous improvement planning.

4.3 RESPONSIBILITIES

Our guarantee requirements are simple and straightforward, with no “small print.”

- The guarantee is for use of the P2C curriculum in Pre-Algebra, Algebra I, Algebra II, and/or Geometry in your middle and high schools. No matter which course they begin with, we guarantee they will improve their math scores by the end of the year.
- Students must engage in the curriculum for 20 to 40 hours over the school year working with P2C. These hours can be spent in a single course or in any multi-course sequence. (Hours are time spent in the P2C math curriculum for one 45-minute period of math per week during the school year, with missed time made up through double periods, during the summer, or before or after school.)

For the GUARANTEE, NS4ed will...	For the GUARANTEE, each school will...
Design and provide technical support to district and school IT personnel to confirm the technical infrastructure for the implementation of P2C courses.	Verify the integrity of the technical infrastructure, including an adequate and accessible computer network with internet access for participating students and their teachers.
Set up and deliver P2C logins.	Implement P2C classroom activities with fidelity.
Track number of hours students are using P2C courses.	Ensure students work on the P2C platform for a minimum of 20-40 hours.
Provide a customized set of 7 days of Professional Development, including: <ul style="list-style-type: none"> • 3-day initial staff training for participating teachers, including “catch-up” training for teachers joining late. • Half-day leadership training workshop for building principal, math department head, and curriculum supervisors (with catch-up sessions). • In-classroom support • Online group coaching in instruction, data collection, and data analysis throughout the year. 	Participate in NS4ed Professional Development <ul style="list-style-type: none"> • Host the half-day leadership training workshop, with the building principal, math department head, and others in attendance. • Release participating math staff so they can attend professional development programs and student assessment review meetings every nine weeks.
Designate a Project Manager as each school’s primary point of contact with NS4ed, and to build and deliver: <ul style="list-style-type: none"> • Benchmarks for student usage and performance; and weekly, quarterly, and end-of-year metrics on meeting those benchmarks. • Easy access to personal content and technical support as needed. • Access to staff assistance for any outstanding issues. 	Share student data with the NS4ed Project Manager, including: <ul style="list-style-type: none"> • A participating student roster for the year • Beginning, middle, and end of the year assessments. • End-of-course grades (within 60 days of tests). • Report on engagement through the survey at the beginning and end of the school year. Follow recommended actions to ensure student success. This may include block scheduling, extended day, summer school, pull-out programs, and increased P2C platform use.

4.4 STANDING BY THE GUARANTEE

Joseph Goins, Ed.D., Founder and Chief Executive Officer

Kari Stillman, MBA, Chief Marketing Officer

Jamisa Williams, Ph.D., Vice President of School Services

Ricky Williams, Director of School Partnerships

Alicia Bennett, Vice President of Professional Development

NS4ed is headquartered in Maryville, Tennessee and currently operates with a full-time staff of researchers, developers, technical, marketing, and support staff. Since its inception, NS4ed has followed through on the mission to provide research, policy, and practice deliverables that yield high value and actionable results for education and the workplace. Through our commitment to delivering research that drives results, our partnerships have led us to provide comprehensive career and college education services. From those services to next-level solutions, our innovative approach focuses on delivering the best possible solutions to support long-term student success.

ATTACHMENT 1. LEARNING ABOUT THE NS4ED LABOR MARKET NAVIGATOR

NS4ed translates local market data to educational career clusters to align with the local economy. Distilled to the school district level, the Labor Market Navigator provides the data to help educators understand the high-value careers available, so they can develop better programs of study.

Designed for educators, the P2C Labor Market Navigator provides clear insight into regional career opportunities. Access to labor market data tools, professional development, Perkins V support, employer relationships, career pathway mapping, career exploration resources, and customized career materials are all components of this model.

1. Navigator-supported Career and Technical Education

The P2C Labor Market Navigator translates regional career opportunities and current and future labor needs into career clusters to help educators create more relevant Career and Technical Education (CTE) and analyze district CTE performance.

The Strengthening Career and Technical Education for the 21st Century Act (Perkins V), passed into law in 2018, was established to ensure that state and local communities provided CTE opportunities to young people, especially those from historically underserved groups. Perkins V required a comprehensive local needs assessment (CLNA), a data-driven approach that includes analysis of student performance data, educator development, program quality, access to programs, and current and projected labor market demands.

The Labor Market Navigator helps school districts to meet Perkins V by providing a detailed analysis of the regional labor market to uncover localized career opportunities. By analyzing the labor market profile of the region, the P2C Labor Market Navigator provides the data educators need to address unmet needs, skill gaps, improve access to CTE programs, chart career cluster maps and pathways, and help provide a more skilled workforce to aid in economic development in the region.

Using the Navigator, educators and policy makers have the data and analysis to:

- Strengthen CTE programs.
- Establish new community partnerships.
- Provide personalized pathways for students to explore their passions.
- Bridge the gap between education and the workplace.
- Conduct and meet Perkin V CLNA requirements.

Both regional workforce and educational data are analyzed to help inform policy in three main ways:

- District Overview

This section of the report examined demographic information and regional CTE statistics, including attributes of the target population. CTE program and enrollment data from regional school districts are assessed to determine the extent to which local schools are preparing to meet the demands of the labor market.

- Industry Overview

High-level business sectors throughout the region are analyzed. Using labor market workforce data, top occupations, and top-employing industries, the report uncovers current and future labor needs.

- Career Cluster Analysis

The National Career Clusters Framework includes 16 career clusters and 79 unique career pathways (shown above). Using this data, the Pathway2Careers Labor Market Navigator provides a detailed analysis of the top career clusters and high-value occupations. This identifies jobs and careers that are in high demand, growing, and provide high wages. By linking career clusters to regional labor market data, the Pathway2Careers Labor Market Navigator identifies market demand and median wages within each cluster.

With this information, educators can make data-driven decisions about embedding CTE within their curriculum. As students understand what it takes for careers beyond school, they see a pathway to success. Educators provide purpose and direction for students as part of their educational process.

Bridging this gap requires changing the way we define success from short-term academic outcomes to long-term employability goals. It's not enough to get good grades. Students need to be career ready.

2. Labor Market Information to Transform Education

By uncovering regional labor demands, job zones, median wages, and salaries, students and educators can identify top career clusters and pathways that offer high-value careers. The curriculum can then be designed with the realities of the local job market in mind. Rather than teaching abstract concepts with limited real-world significance, teaching gains context and students find meaning.

A labor market analysis might include, for example:

- District overview, including population by age, race, and educational attainment.
- CTE enrollment by career cluster.
- Workforce regions.
- Industry overview, including the top employing industries in the region, and top occupations by job roles.
- Career cluster analysis, including annual openings, median wage, and projected job growth.

- High-value cluster ranking.
- Top regional occupations, sorted by annual openings, median wage, growth rate, and high-value.

This detailed analysis provides local leaders with regional labor market information so they can better align CTE programs to prepare students for the high-value occupations and labor force needs within their region.

3. NS4ed Navigator-driven Technical Services

- MA Technical Assistance & Early College

Fifty high schools and 24 college and universities use NS4ed's Technical Assistance services to increase the capacity of schools to improve, sustain, and expand the services and supports provided within the state's Early College Programs (ECPs). NS4ed is also working with the Massachusetts Department of Elementary and Secondary Education and Department of Higher Education to increase the number of underrepresented students in ECPs.

- The Boy's Latin of Philadelphia School

Boys' Latin School in Philadelphia is recognized for its rigor and success in helping its minority populations graduate high school and continue in college. NS4ed provides the schools with customized labor market data, career exploration tools, and math career-connected learning curricula.

- Nevada

In 2023, NS4ed began a statewide implementation in Nevada, with every school now having the Labor Market Navigator and Career Exploration curriculum. In addition, 15,000 students will gain access to the P2C math curriculum.

- New Mexico

NS4ed contributed Technical Assistance services to support 21 Early College High School programs in the state, providing program support, structured meetings, and professional learning communities; and has developed and maintains a community of best practice website. NS4ed also developed and maintains the NM School Counselors' Community of Best Practice.

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OUR COMMITMENT

Through our commitment to drive results, our partnerships have led us to building comprehensive career and college education solutions. We focus on solutions relevant to education practices and ensure a seamless approach to support career readiness efforts in schools everywhere. Our innovative approach focuses on delivering the best possible solutions to support long-term student success.

“

It really kept my students engaged. They were excited because it was something different and unique to them.

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