



# Career and Technical Education

The Evolving Landscape of K–12 CTE



# What Is Career and Technical Education?

Career and Technical Education (CTE) provides students with an opportunity to learn about careers, develop critical workforce skills, and explore how their personal interests and abilities can align them to a learning pathway that supports their educational and career goals.

CTE courses or programs teach students about jobs, prepare them for those jobs through practice with relevant skills and content, provide real-world opportunities to observe and participate in career-relevant experiences, and even create pathways to earning career credentials.

According to the U.S. Department of Education:

*“Career and technical education (CTE) provides an important pathway to success for high school students and offers each student opportunities to personalize his or her education based on their career interests and unique learning needs. CTE refers to courses and programs designed to prepare students for careers in current or emerging professions.”*

## How Has CTE Changed Over Time?

Career and Technical Education has its roots in the early 20th century in the American education system when the government invested in “vocational education” through the Smith-Hughes Act. CTE has evolved continually over the course of the century. Most recently, the U.S. government renewed its investment by passing Perkins V, which provides approximately 1.4 billion dollars in annual funding for CTE.

Not long ago, the academic community considered vocational–technical courses as a pathway for students not on a college track. Now, CTE is for all students, regardless of their post-high school pathways. In response to a rapidly changing workforce and academic landscape, CTE is designed to prepare students for careers that may not even exist yet.

Perkins V focuses on making CTE accessible and meaningful for historically underserved populations, requiring that districts “continually make meaningful progress toward improving the performance” of students with disabilities, low-income and homeless students, English learners, and more.

Perkins V also emphasizes the importance of systems collaboration, within schools and among communities.

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*Perkins V calls for collaboration among middle and high schools, higher education institutions, employers, and other partners to provide an integrated approach to delivering robust CTE programs through statewide sector or industry partnerships.*

— All4Ed<sup>1</sup>

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# Our Approach to CTE Over the Decades

We've been producing CTE titles for a long time. CTE textbooks from the 1990s and early 2000s on the left have made way for digital-first, soft-skills embedded, student-centered programs on the right.

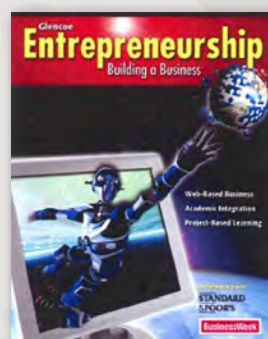


In fact, our company's very first publication, a magazine from the early 20th century, provided readers with industry news and expert opinions about electric

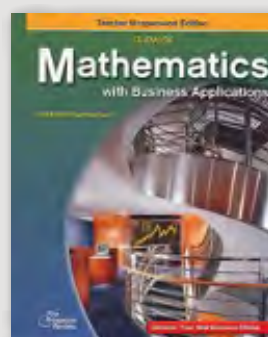
railways. While it may not have been for PreK–12 learners, we've certainly been passionate about educating the public on innovations in industry for a long time!



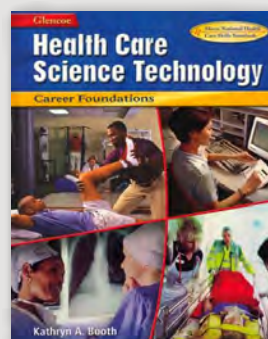
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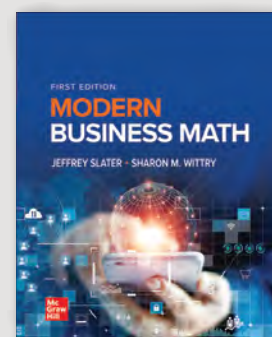
Hover over a cover to learn about a program.



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Careers and Basics of  
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## Who Takes CTE Courses, and Who Teaches Them?

Career and Technical Education courses are generally offered at the high school level, and increasingly offered in middle school, as well. Any student, regardless of their career aspirations, can benefit from CTE coursework.



In 2021–2022, there were **8,151,708** secondary CTE participants nationwide—a **6.8% increase** from 2007–2008

Teachers from a variety of backgrounds and specialties are tasked with picking up CTE courses in U.S. schools. Some teachers exclusively teach CTE, while others may teach CTE courses in addition to core classes.

To understand how CTE varies in application between schools and individual students, it can be helpful to borrow terms from the U.S. Department



**1/3 of public schools** that reported CTE teacher vacancies in 2020–2021 found those **vacancies very difficult to fill** or were not able to fill them<sup>1</sup>

of Education’s work. Researchers with the U.S. DOE refer to high school students who have earned at least one credit in any CTE course as a “CTE participant” and students who have earned two or more credits within a single program of study as “CTE concentrators.”

The nuances of modern CTE participation are a far cry from the generations-past notion of limited “Vo-Tech” tracks and demonstrate the personalized approach schools are taking to CTE pathways. This differentiation becomes important when we look at the impact of CTE on student outcomes.



“Teaching a CTE class was a realization of my dream, fueled by my enthusiasm for incorporating technology into the classroom and equipping every student with the tools they require to thrive. I collaborate with multiple companies and organizations, **enabling students to engage in global communication and explore diverse career paths.** Through our CTE program, students acquire the capability to communicate effectively with others and construct a digital portfolio that showcases their talents and proficiencies.”

— Heather Brantley,  
Web Communications CTE Teacher

“I am excited to be in CTE because **I see the desire in our kids to create their own successful destiny** outside of a four-year degree. As a teacher, I want to make the biggest impact I can and building relationships is the way to do that. CTE gives me the opportunity to reach kiddos without having the stress of being a tested subject.”

— Stacie White,  
CTE Career Explorations Teacher



“As a CTE student I learn a lot about digital safety, ways to help not only myself but other people as well to not be hacked, stolen identities, and ways to use technology for good and safety. ... In this class we learn about ways to be a creator, an inventor, and a maker... how to code games and educational games, videos, and photos to engage with their teacher, to help them learn more, and to have fun.”

— 8th Grade CTE Web Communications Student



# What Is the Purpose of Career and Technical Education?

The purpose of CTE is to set students up for success in their academic and career pathways. CTE fulfills this purpose by providing students with:

1. **Exposure to and information about the workforce they will someday enter.**
2. **Practice exercising career-relevant soft skills in real-world contexts.**
3. **Opportunities to reflect on their own interests and how they can apply those in a career.**
4. **Pathways to Industry Recognized Credentials (IRCs), apprenticeships and internships, licenses and degrees, and more.**

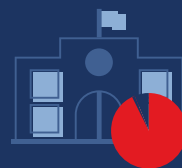
Research indicates that CTE is, in fact, delivering positive results.

## According to the U.S. DOE, high school students who were CTE concentrators:

- **Graduated from high school at higher rates** than their non-concentrator peers.
- Enrolled in postsecondary education **within eight years of their expected high school graduation** at slightly higher rates than non-concentrators.
- Were **employed full-time at higher rates** eight years after their expected high school graduation compared to non-concentrators.
- Had a **median annual earnings higher than for non-concentrators**, eight years after their expected high school graduation.



Those with CTE associate degrees earn **\$10,000 more per year** than associate degrees in other fields while **limiting student debt**<sup>1</sup>



**92%** of high school students are **engaged in CTE**<sup>1</sup>



CTE holds a purpose for our communities, too. The nation needs skilled workers now, and as technology rapidly changes the face of our economy and the nature of work, the nation will need workers with dynamic problem-solving, communication, and other fundamental soft skills.



The U.S. will face a **6.5 million** projected **deficit of skilled workers** in the next decade<sup>2</sup>

Put another way: By 2030, if all jobs were filled by exactly only 1 individual, 6.5 million important roles in our society would not be filled!

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*“Despite millions of job openings around the country, 74% of employers report a persistent mismatch between the skills they need and the skills workers have... A majority of U.S. workers, both employed and unemployed, report seeking additional career development or reskilling opportunities. And more than half of Americans looking to develop job skills prefer CTE-related programs and credentials.”<sup>2</sup>*

— Association for Career & Technical Education (ACTE)

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## Spotlight on Middle School CTE

While CTE is commonly associated with high school, middle school CTE is critical. It meets students where they are on their path to self-discovery, helping them learn about themselves and the world around them.

- It provides structured learning time for students to ask and seek answers to questions about their futures.
- By learning about careers in middle school, students are better positioned to make informed decisions about class selection and post-graduation decisions in high school.
- Middle school CTE boosts motivation and engagement, and makes learning relevant.
- Middle schoolers are developmentally ready to practice career-relevant soft skills.
- Early exposure to career case studies with diverse representation can help combat harmful stereotypes about who can do what jobs.

Importantly, middle school CTE doesn't ask students to decide what they want to be when they grow up. It gives them opportunities to explore how their skills and passions could someday help them thrive outside of the classroom and exposes them to career options.

# Our Approach to Career and Technical Education Curriculum Design

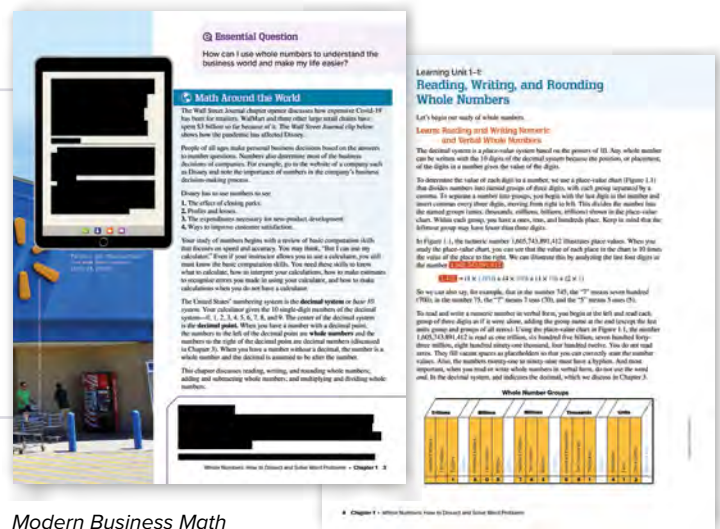
We believe CTE curriculum should:

## 1 Engage students from the start.

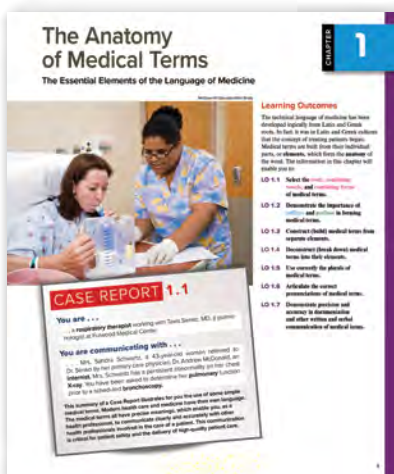
Career and Technical Education courses, of all the classes students take, have no excuse to be dull! With such interesting material that's so immediately relevant to students' lives, it's crucial that curriculum designers leverage every tool at our disposal to capture students' attention and spark inspiration.

Our CTE course materials contain multi-media resources, detailed career case studies, and compelling activities to connect real-world careers and problems to students' interests.

In this example from *Modern Business Math*, students learn about reading, writing, and rounding whole numbers through the context of a real-world news article about the impact of COVID-19 on retailers.



Modern Business Math



Essentials of Medical Language

The beginning of each chapter of *Essentials of Medical Language* opens with a “You Are... Communicating With...” card that places the student in the role of a health professional in a field related to the body system and medical specialty covered in the chapter.



# 2

## Boost student motivation.

Career and Technical Education content and activities should motivate students to learn and grow. We design our CTE lessons with student interests, perspectives, and psychology in mind.

For example, *Careers and Basics of Business* leverages ARCS, an instructional design model based on psychology that focuses on incorporating motivation into lessons. ARCS stands for Attention, Relevance, Confidence, and Satisfaction. By designing these four key areas into lesson plans, we shift the focus from the content to the delivery, ensuring CTE material captures students' attention, is relevant to their lives, helps them build confidence as capable learners, and leaves them with a satisfying sense of accomplishment.



### INSPIRED IDEAS • 6 min read

*How to Design Engaging and Motivating Lessons with the ARCS Model*

For a detailed example, check out this blog by scanning the QR code or visiting

# 3

## Be turn-key so that any educator, regardless of background, can implement it with confidence.

CTE teachers come from a variety of educational pathways and very often are tasked with a full course load outside of their CTE responsibilities. CTE programs must be streamlined, flexible, and easy to navigate so that time-strapped educators can implement it with fidelity. Our CTE programs contain robust presentation materials, discussion prompts, pre-made assessments, question banks, and project-based learning resources to support teachers throughout the school year.

For example, project-based learning can be challenging to implement, especially for new or overwhelmed educators. We've included supportive, comprehensive teacher guides and rubrics to guide teachers through leading engaging projects in *Career Explorations*.

### Manufacturing Project

#### Teacher Project Guide

##### Background

This teacher resource guide is aligned with most high-quality PBL Learning standards. The project varies in difficulty and intensity, depending on the number of resources, timeline, project, and subject chosen. This project requires you to ask your students to solve a real-world problem in the manufacturing industry that they are passionate about. Students have the opportunity to:

1. participate in a class discussion
2. choose their own problem related to the Manufacturing industry
3. produce a high-quality product related to their problem and present it to the class.

Please keep in mind, you can choose to group students together to work individually – or a mixture of both! The problems they choose to solve are unique to them and are meant to encourage interactions within teams in the real world. Allow for open inquiry and best to clarify but not guide the discussion beyond maintaining it on track.

##### Class Discussion, Authenticity, and Student "Voice & Choice"

The first step to leading this project in your classroom involves facilitating a class discussion about career opportunities in the Manufacturing industry. This discussion is a key component of the project and is designed to engage students in thinking about their future and the role of manufacturing in our society.

#### Student Project Guide

##### Important Dates

Record the due dates set by your teacher below:

**Final Product:** \_\_\_\_\_

##### Background Knowledge

Take a moment to look around you. Have you ever stopped to think about the many of the objects you interact with every day are made by complex machines. Sometimes, the terms "manufacturing" and "production" are used interchangeably. For example, clothes are made by apparel manufacturers, and cereal is created in food processing plants. The things that are made range from simple objects like paper clips to complex machines like computers. Manufacturers use their hands or highly specialized machinery to purchase from other manufacturers to create their products.

The United States is the world's largest manufacturing economy, producing

#### Rubric

Each item is graded using a standards-based grading scale of 1–5 (1: little to no mastery; 2–3: partially meets expectations; 4: meets expectations; 5: advanced).

Criteria	Grading Rubric			
	Little to No Mastery (0–1 points)	Partially Meets Expectations (2–3 points)	Meets Expectations (4 points)	Advanced (5 points)
<b>Research</b>	Demonstrates poor understanding of problem/topic  Utilizes less than two sources or sources used are unreliable  Summary is unclear or incomplete	Demonstrates some understanding of problem/topic  Utilizes at least two reliable sources  Summary is mostly clear and concise	Demonstrates thorough understanding of problem/topic  Utilizes at least three reliable sources  Summary is clear and concise	Demonstrates exceptional understanding of problem/topic  Utilizes numerous reliable sources  Summary is insightful and concise
<b>Problem Identification and Product Creation</b>	Identifies a problem that is not unique or not relevant  Proposes a solution or product that does not address the problem  Solution or product is not feasible or is not a product	Identifies a somewhat unique and relevant problem  Proposes a somewhat creative solution or product that somewhat addresses the problem  Solution or product is somewhat feasible	Identifies a unique and relevant problem  Proposes a creative solution or product that effectively addresses the problem  Solution or product is feasible and realistic	Identifies a highly unique and relevant problem  Proposes a highly creative solution or product that effectively and innovatively addresses the problem  Solution or product is highly feasible and realistic

*Career Explorations* Manufacturing: Teacher Guide, Student Guide, and Rubric

# 4

## Include embedded soft skills practice with real-world contexts and connections to careers.

According to a study by LinkedIn (2023), 72% of American executives surveyed said soft skills are more valuable to their organization than AI skills. In a study of billions of job listings, America Succeeds found that 7 out of the 10 most listed job requirements are related to soft skills. It's critical that students have plenty of opportunities to practice soft skills, regardless of their academic and career path.

Soft skills practice is embedded across our CTE course materials, designed to engage students through connections to real-world careers. For example, as students interact with and learn about the various careers available to them in *Career Explorations*, they are also able to practice the skills needed to be successful in those careers through various soft skill activities and questions.

In this example, students are tasked with inferring what would qualify as “related experience” in a help-wanted ad.



Career Explorations

# 5

## Empower students to acquire and practice foundational core skills—in math, reading, and writing.

CTE isn't a replacement for core courses, it's an opportunity to apply and practice reading, writing, math, and critical thinking skills while obtaining career-relevant knowledge.

The real-world questions and activities in our CTE programs help students master the applied math, graphics literacy, and reading comprehension skills assessed by certification exams like ACT WorkKeys© and NOCTI and used every day on the job.

# 6

## Begin in middle school.

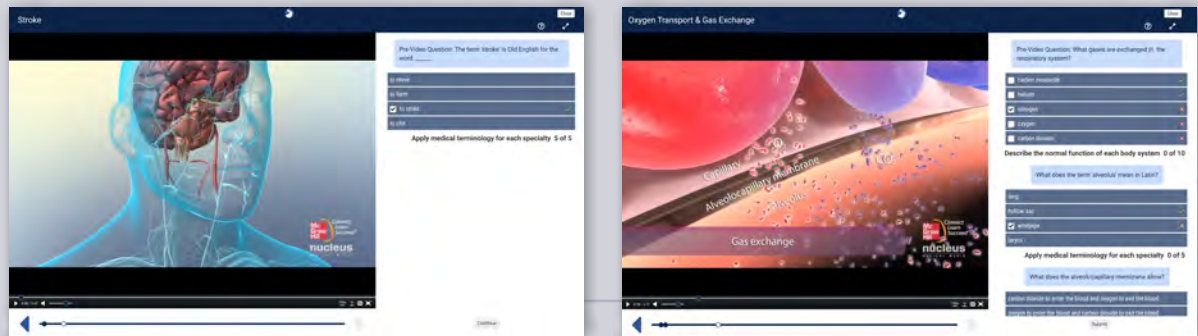
Middle school students deserve the opportunity to practice soft skills and learn about the workforce to help inform their decisions about their personal pathways. Our middle school program, *Career Explorations*, introduces students to hundreds of diverse careers and critical soft skills needed to set them on a purposeful path through high school and beyond.

# 7

## Meet the needs of any classroom with flexible, agile material.

No two CTE classrooms are alike—particularly as modern middle schools and high schools offer increasingly flexible learning and grading options to meet student needs, and as student populations become more and more diverse. Students deserve learning opportunities that meet them where they are, in a modality that suits their needs, and challenges them just enough to grow.

Our modern CTE courses contain robust, rigorous, up-to-date content in both print and digital formats. They're fully accessible and multimodal, flexible for different teaching styles, scaffolded for student needs, and accommodate hybrid learning environments.



For example, these immersive digital simulations from *Essentials of Medical Language* help students develop a deeper understanding of body systems.

Virtual Labs in *Hole's Human Anatomy & Physiology* deliver a realistic, simulated lab experience that better prepares students with the fundamental skills for hands-on lab work or can replace hands-on labs. *Anatomy & Physiology REVEALED®* is the ultimate dissection experience that visually enriches your lectures and labs with 3D Interactive Models, engaging animations, and real-life images.

### Hole's Human Anatomy and Physiology

(16e) ©2022, Welsh

#### The Gold Standard Approach to Anatomy & Physiology

A market leader for over 40 years, *Hole's Human Anatomy & Physiology* delivers a comprehensive, in-depth exploration of anatomy and physiology while placing emphasis on the fundamentals for students who have little-to-no prior science knowledge. The proven Learn, Practice, Assess learning system ensures student understanding, application, and mastery of complex concepts while the Understanding Words feature builds a solid anatomy and physiology vocabulary.

**With this new edition of *Hole's Human Anatomy & Physiology* we introduce Charles Welsh as the primary author to provide a cohesive narrative with a single voice.** With over 30 years of experience in anatomy and physiology classrooms instructing future nurses and other allied health professions, Dr. Welsh brings a fresh perspective to this well-respected text. Students will connect with the accessible, engaging, and relevant coverage that integrates real-world issues, clinical applications, and the latest in scientific advances. Additional teaching and learning features include:

- An enhanced dynamic art program to help clarify key principles, increase visual impact, and ensure accuracy to reinforce important concepts.
- The chapter level Career Corner that introduces students to a variety of fields of practice and related occupations.
- A Lab Manual with 34 hands-on activities designed to complement any anatomy and physiology course.
- An eBook and SmorBook® adaptive reading experience accessible anytime, anywhere.
- Editable test banks for each chapter.
- Full-color animations illustrating important processes to help augment classroom instruction.
- An online Teacher Manual including answers to all assessment questions, lecture suggestions and guidelines, ELL activities, application questions, and critical thinking issues.
- Customizable PowerPoint presentations to help teachers structure classroom instruction.

#### The Ultimate Dissection Experience

*Anatomy & Physiology REVEALED® (APR)* is the ultimate dissection experience that visually enriches your lectures and labs with 3D Interactive Models, engaging animations, and real-life images. This interactive tool dynamically reinforces key concepts to help your student develop a deeper insight into the study of human anatomy and physiology.

[mheducation.com/prek-12](http://mheducation.com/prek-12)



# 8

## Make learning experiences personalized.

Every student follows their own winding path to learning and working. When possible, CTE instruction should be personalized to match their unique interests and needs.

SmartBook®, an adaptive learning solution included with most of our CTE courses, enables teachers to deliver personalized instruction. Drawing from key learning science concepts like spacing, chunking, and interleaving, SmartBook creates mini cycles of questions that consist of no more than five concepts at a time creating smaller, easier to absorb “chunks” of content for students to review and practice key concepts at their own pace.

We’re also working to personalize students’ school-to-work pathways through the McGraw Hill Career Center, which is currently embedded in . The Career Center uses a research-based, student-friendly career assessment to help students match with potential careers based on their strengths and interests. In the Career Center, students can sort and explore hundreds of potential jobs in deep detail. Each career profile includes a required reading level compared to the student’s current reading ability based on their performance in the program, providing learners with a tangible example of the importance of literacy in the real world and a goalpost for improving their skills.

# 9

## Help students learn about themselves, illuminate the world around them, and prepare them for the future.

Finally, Career and Technical Education programs should empower students to carve out their own paths to self-discovery, academic growth, and professional satisfaction. Our CTE courses are all built with the student experience at the center of the design, providing them with opportunities to ask questions about themselves and explore how they can leverage their strengths to create a place for themselves in the world.

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*CTE is the sum of all your experiences that contribute to both your value in the workplace and your ability to create a workplace that is of value to you. It’s a coming-of-age story, for all learners and workers, for a lifetime.*

— Pat Keeney, Director  
of CTE, McGraw Hill

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### LEARN MORE

Scan to explore our Career and Technical Education Programs or visit .

