

# Maryland Classroom

A Publication from the Maryland State Department of Education

## CTE: Educating Tomorrow's Workforce Today

By the time the Carl D. Perkins Vocational and Technical Education Act was reauthorized in 2006 as the Carl D. Perkins Career and Technical Education (CTE) Act, vocational education—first federally legislated 85 years earlier—had changed a lot more than its name. Whereas traditional vocational education provided students trade-specific skills that would prepare them for work straight out of high school, today's CTE is a rigorous, relevant program of study that prepares students for both college and careers.

The 2006 Perkins Act emphasizes preparing CTE students for high-skill, high-wage, high-demand careers in existing and emerging professions; integrating challenging academic and career and technical instruction; better linking secondary and postsecondary programs; and supporting strategic partnerships among high schools, colleges, and business and industry.<sup>1</sup> In fact, the legislation was strikingly similar to Maryland's own CTE system, which has long been recognized as a national model.

### 21st-Century CTE

Maryland redesigned its CTE program a dozen years ago to prepare students for the 21st Century's global economy and its rapidly changing workforce needs. With 350 business and industry representatives, the state created a program whose emphasis is problem-solving and critical thinking, rather than narrow, procedural knowledge.

With its industry partners, Maryland organized its CTE program around ten career clusters—groupings of related occupations that, together, constitute a full range of careers (see box).<sup>2</sup> The clusters help connect educators and employers and provide a framework for responsive, well-articulated workforce development. Within each career cluster are 4–9 more specific career pathways, and populating those pathways are 48 distinct programs, like Civil and Architectural Engineering, IT Database Modeling, and Automotive Technology. (For a sample of CTE programs, open up this newsletter.)

CTE programs are responsive to shifting workforce priorities and emerging careers. With science, technology, engineering, and math (STEM) driving the 21st-Century economy and the military's Base Realignment and Closure plan bringing tens of thousands more STEM-dependent jobs to Maryland, newer programs like Pre-engineering, Biomedical Sciences, Manufacturing Engineering Technologies, and Homeland Security and Emergency Preparedness<sup>3</sup> are attracting more and more students.

### Adding Value to the Diploma

In Maryland, CTE program completers must take the full core academic course-load, as well as at least four sequential credits of technical coursework in a CTE pathway. While students may enroll in individual CTE courses, completing a CTE program of study includes work-based learning (e.g., internships, industry-mentored projects), enabling a head-start on college and careers. After high school, many CTE graduates go on to apprenticeships—advanced technical training that allows them to earn an income in their chosen career while gaining valuable experience in it.

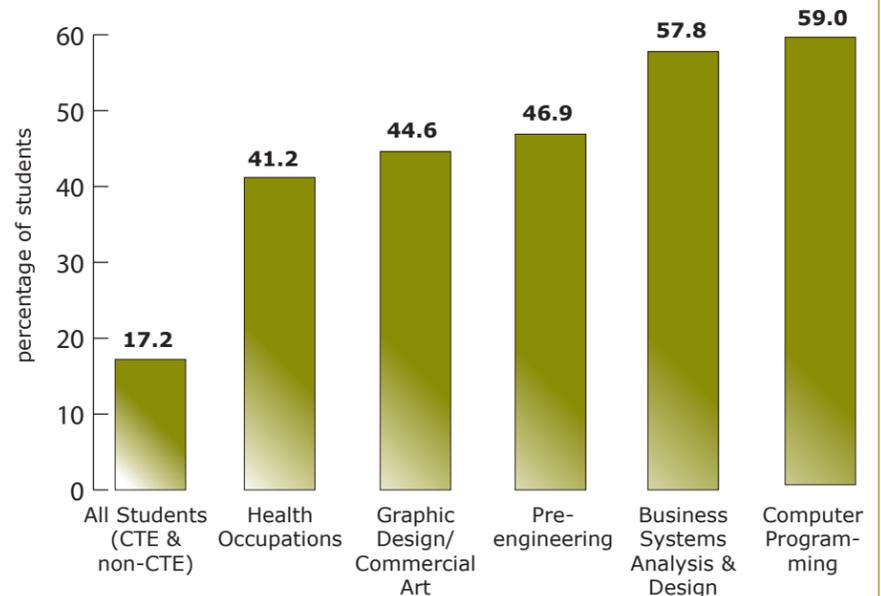
Plus, virtually all CTE programs offer students the chance to earn college credits and/or industry-recognized certification, credentials, or licensure. For instance, students completing the IT Networking Academy (a program in the Information Technology cluster) can earn college credit and a host of sought-after certifications: CompTIA A+, Network+, and Server+, plus Cisco Certified Entry Networking Technician (CCENT), Network Associate (CCNA), and Network Professional (CCNP). In fact, Maryland's Cisco Academy was the first in the nation to offer advanced CCNP courses in high school.

### Local Programs, Regional Needs

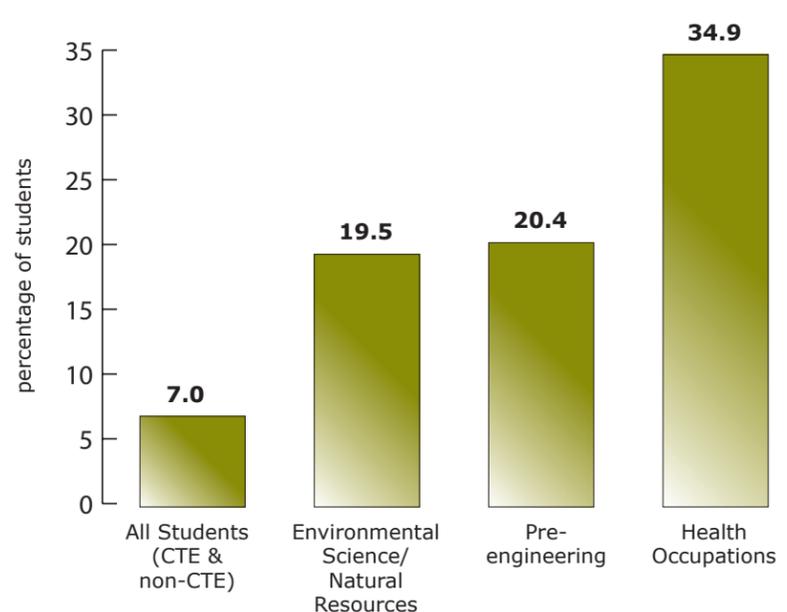
Given that CTE programs are closely aligned with regional economic and workforce-development priorities, not all high schools have programs in all career clusters. Based on local needs and opportunities, each school system decides which clusters and corresponding pathways will be offered. All school systems have a Local Advisory Council—made up of employers and industry and union representatives—that works with the system on long-range CTE planning. Plus, each program of study operates under the guidance of a Program Advisory Committee, a group that monitors the program's rigor and scope, as well as its alignment with technical skill standards and industry innovations.

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Percent of students completing a math course above Algebra II with a grade of B or better, by CTE program



Percent of students completing 4 science credits with a grade of B or better, by CTE program



### Maryland's CTE Career Clusters

- Arts, Media, and Communication
- Business Management and Finance
- Construction and Development
- Consumer Services, Hospitality, and Tourism
- Environmental, Agricultural, and Natural Resources Systems
- Health and Biosciences
- Human Resource Services
- Information Technology
- Manufacturing, Engineering, and Technology
- Transportation Technologies

<sup>1</sup> The 2006 reauthorization is the first to mention baccalaureate programs. Previous Acts specifically defined vocational education as preparing students for further education and careers other than those requiring a baccalaureate, masters, or doctoral degree.

<sup>2</sup> In the mid-90s, Maryland became one of the first states to organize its CTE program into career clusters. The federal government required such organization a few years later.

<sup>3</sup> The Homeland Security and Emergency Preparedness program is being piloted this year in Harford County. Biomedical Sciences is being piloted in Baltimore City and in Anne Arundel, Cecil, Frederick, Harford, Montgomery, and Washington counties.

**Maryland leads the nation** in scientists and engineers as a percentage of the workforce, ranks 2nd in information technology jobs, and boasts the nation's fourth-largest cluster of biotechnology companies. The state is home to nearly 400 federal, academic, and private research centers and leads the U.S. in the amount of federal research and development funding obligated each year.

To prepare students for high-wage, high-demand jobs in this STEM-driven economic climate, CTE has launched and expanded a number of relevant programs, including Aerospace Engineering, Bioscience Engineering, Homeland Security, Manufacturing Engineering Technologies, IT Networking, and IT Database Management. Two more STEM-dependent programs are profiled here.

## Manufacturing, Engineering & Technology

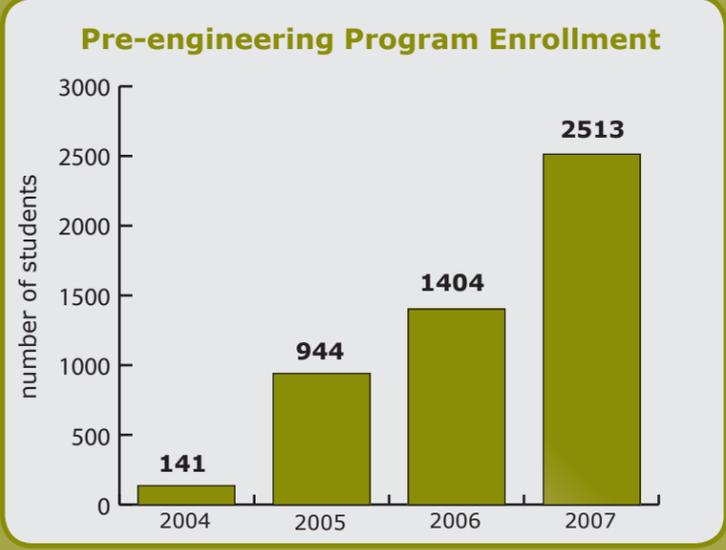
### Pre-engineering

In 2004, Maryland began offering Project Lead the Way (PLTW), a national pre-engineering program whose goal is to produce more college engineering majors and, ultimately, more working engineers.

Interest in the program—now offered in 47 Maryland high schools—has skyrocketed. More than 2,500 students are enrolled; that's a 79-percent jump over last year alone.

Twenty-five high schools have received college certification, allowing students to earn credit at 35 PLTW-affiliated colleges and universities nationwide, including the University of Maryland–Baltimore County, the state's university affiliate.

Representatives from business and industry, industry associations, colleges, and state agencies collaborate with school systems on program delivery. ([www.PLTW.org](http://www.PLTW.org)) ■



### PLTW Pre-engineering

#### Foundational Courses

- Introduction to Engineering Design
- Principles of Engineering
- Digital Electronics

#### Specialization Courses

- Computer Integrated Manufacturing
- Civil Engineering and Architecture
- Aerospace Engineering
- Biotechnical Engineering

#### Capstone Course

- Engineering Design and Development

## Health & Biosciences

### Biomedical Sciences

Given the remarkable success of the pre-engineering program, Maryland—along with six other states—has launched a Project Lead the Way program in biomedical sciences. Seven school systems are now piloting the program, which is intended to yield more—and more diverse—students majoring in science, engineering, and biotechnology. Students enrolled in the program take Principles of the Biomedical Sciences, Human Body Systems, Medical Interventions, and Science Research, and they can earn college credit upon program completion.

Villa Julie College provides training to school systems; business and industry, colleges, and state agencies partner on program delivery. ([www.PLTW.org](http://www.PLTW.org)) ■

Maryland is in the thick of the nation's economy-driving industries: aerospace, defense, and systems engineering; bioinformatics and biotech; computer science; and telecommunications.

## Consumer Services, Hospitality & Tourism

In 2005, Maryland welcomed more than 27 million visitors—visitors who spent \$10.7 billion here. Employing 230,000 people, the Hospitality and Tourism industry generates about one in every ten private-sector jobs in Maryland, and is the 4th-largest segment of the state's economy. It's projected that more than 1 million industry jobs (job growth plus replacement demand) will be added through 2012. Clearly, Maryland has a tremendous need for graduates skilled in the hospitality, travel, and tourism sectors, and CTE has a number of high-quality programs responding to that need.

All three of the programs profiled here offer industry-recognized credentials, all three are supported by a state or national partner organization, and all three have articulation agreements with Baltimore International College, meaning that program credits can be transferred there.

### American Culinary Federation

The American Culinary Federation program prepares students for careers and further education in professional cooking or baking. Five Maryland high schools are accredited in culinary arts and professional baking—a 1½-year process that includes curriculum review, site visits, and assessments. Students completing the program earn points toward one of two industry credentials, Certified Culinarian or Certified Pastry Culinarian. ([ACFchefs.org](http://ACFchefs.org))

### Food and Beverage Management

The ProStart program, developed by the National Restaurant Association Educational Foundation (NRAEF), introduces students to careers in the restaurant, foodservice, and hospitality industries. Enrolled students complete 400 hours of mentored, work-based learning and can earn the National ProStart Certificate of Achievement, an industry award that confers eligibility for NRAEF scholarships. ProStart is given significant support by the Maryland Hospitality Education Foundation. ([NRAEF.org/ProStart](http://NRAEF.org/ProStart) & [MHEF.org](http://MHEF.org))

### Lodging Management

The Lodging Management Program, designed by the American Hotel and Lodging Educational Institute and supported by the Maryland Hotel and Lodging Association, is a national program that introduces students to careers in the lodging industry and builds their business, management, leadership, and workplace skills. Enrolled students may earn the industry-recognized Certified Rooms Division Specialist credential. ([www.LodgingManagement.org](http://www.LodgingManagement.org)) ■

... [T]here are examples that show applied learning does not ... come at the expense of academic rigor. Maryland's example shows that CTE, when at its best, can help high schools draw on the advantages of applied learning while equipping students to meet college and career expectations.

National Governors Association, Center for Best Practices  
Retooling Career Technical Education  
June 2007

## Human Resource Services

### Teacher Academy of Maryland

For several years, Maryland has faced a critical shortage of qualified teachers, especially in STEM subjects (see box). For as many years, the state has initiated programs to combat the shortage. The Teacher Academy of Maryland—exposing students to the teaching profession early and giving them a jump on college coursework—could be an effective remedy. The Academy enrolled 580 students in 2006–07, 3½ times the enrollment of 2005–06 (the Academy’s inaugural year). The “grow your own” aspect of the Academy is important, too, given that retention among teachers recruited outside Maryland is lower than it is among in-state recruits.

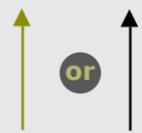
Students start the Academy in 10th grade and take a four-course sequence: Human Growth and Development through Adolescence; Teaching as a Profession; Foundations of Curriculum and Instruction; and Education Academy Internship. Students can then take the ParaPro, which Maryland requires for certification as an instructional assistant.

From the Academy, students can enroll directly in a four-year college with a teacher education program, netting credit for their high school coursework. Or they can enroll in any of the 13 community colleges statewide that offers the articulated Associate of Arts in Teaching degree—a two-year degree whose coursework transfers to any in-state, four-year college (public or private) with a teacher-preparation program.

Towson University, which graduates about one in every four teacher candidates—far more than any other college in Maryland—is the state’s program partner. ■

### 4-Year College

BA/BS in Early Childhood, Elementary, Secondary, or Special Education



### Community College

Associate of Arts in Teaching

### High School

Teacher Academy of Maryland

## Top 10 Critical Shortage Subjects

(Percentages are the proportion of filled teaching slots)

- Physical Science: 15%
- Health Occupations: 17%
- Computer Science: 47%
- Earth/Space Science: 57%
- Latin: 62%
- Dance: 63%
- Physics: 70%
- Technology Education: 73%
- Special Education: 74%
- Chemistry: 81%

Maryland Teacher Staffing Report: 2006–2008  
Maryland State Department of Education, 2006

## Business Management & Finance

### National Academy of Finance

The National Academy of Finance (NAF) is one of four academies in the National Academy Foundation<sup>1</sup> and operates in 264 schools nationwide. It’s a nine-course program that prepares students for careers in the financial services industry—accounting, banking, insurance, securities, and real estate, among others.

The Academy, which enrolled 420 students last year and graduated 79, is predicated on close partnerships with the local business community. In fact, students must complete an internship during their junior or senior year in order to graduate from the program.

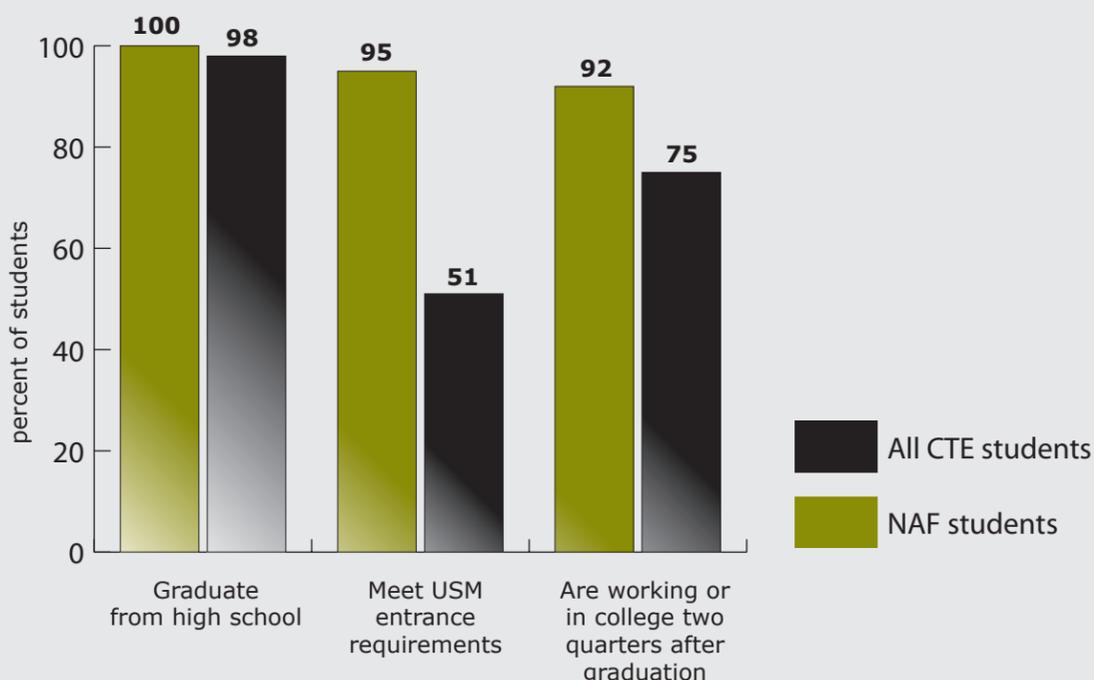
Achievement among NAF students is remarkable: 100 percent graduate from high school, 95 percent meet the University System of Maryland’s entrance requirements, and—two full quarters after graduation—92 percent are in college or working. (NAF.org) ■

<sup>1</sup> The National Academy Foundation was created as a partnership between business and industry; it serves 50,000 students in 41 states and Washington, DC. Nationwide, more than 2,500 employers are involved in the four academies (Academy of Finance, Academy of Hospitality and Tourism, Academy of Information Technology, Academy of Engineering)—offering internships, volunteering in classrooms, acting as career mentors, and serving on advisory boards.

### National Academy of Finance

- Introduction to Finance and Accounting I and II
- Economics and the World of Finance
- Banking and Credit
- Securities and Insurance
- Financial Planning
- International Finance
- College Accounting I
- College Accounting II
- Computer Science

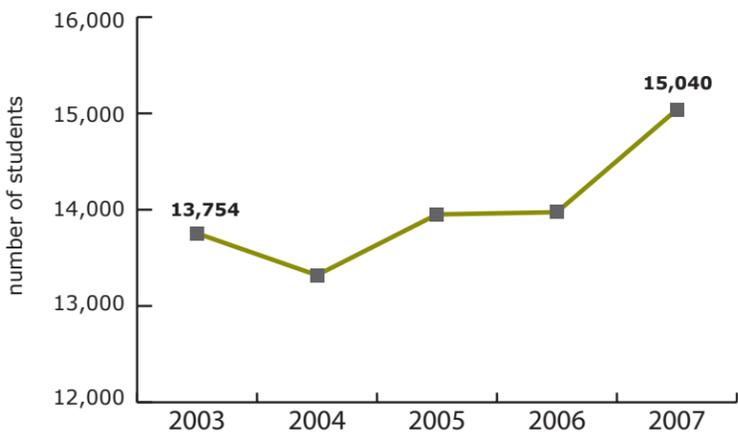
### Outcomes: NAF Students vs All CTE Students



## Enrollment & Completion

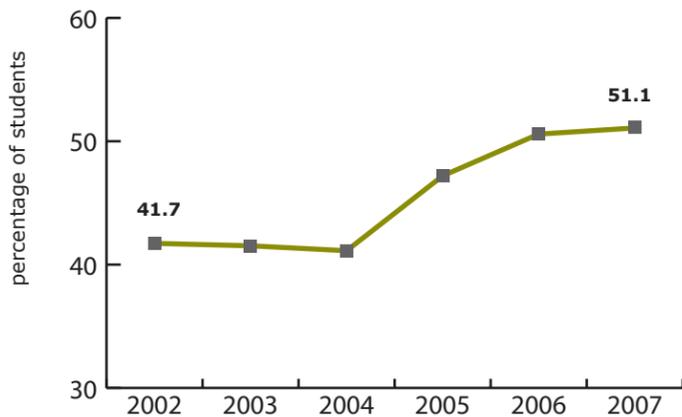
While CTE enrollment has fallen since 2004—when nearly 23,000 more students signed up for a CTE course than had the year before—the number of students completing a CTE program has actually risen. Last year, nearly half of all high school students took a CTE course, and more than one-quarter completed a CTE program.

**High School Graduates Completing a CTE Program: 2003-2007**

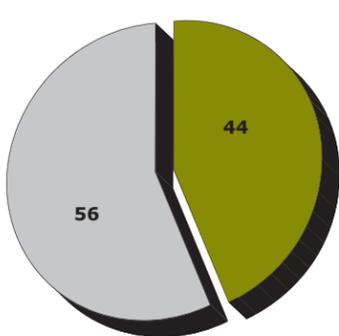


Plus, more than half of all CTE program completers also completed a rigorous academic program that meets the University System of Maryland's entrance requirements. The state's 51-percent "dual-completion" rate is a nearly 10-percentage-point gain over 2002 and an extraordinary 37-point gain over 1992.

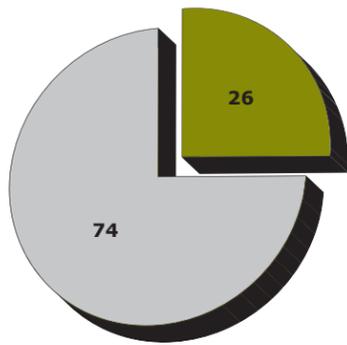
**CTE Dual Completers: 2002-2007  
(CTE graduates who meet USM entrance requirements)**



**CTE as a percentage of all high school enrollment**



**CTE as a percentage of all high school graduates**



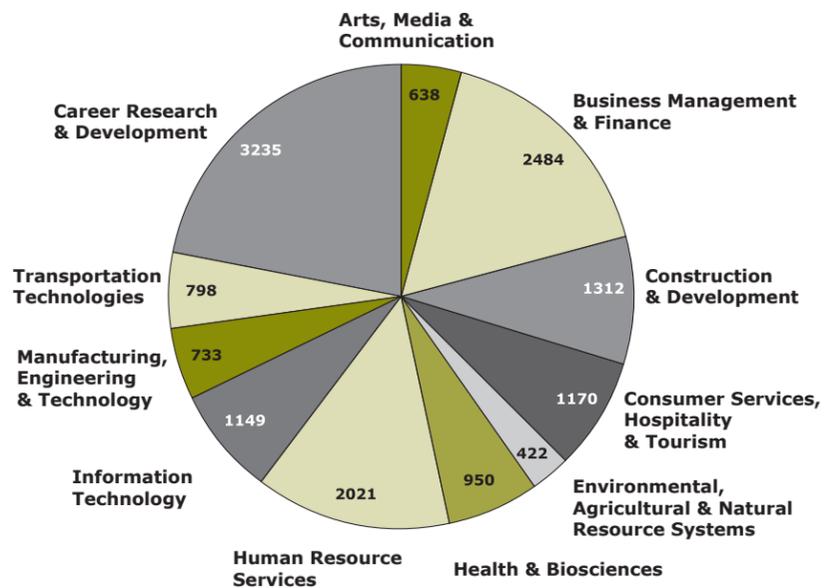
enrolled in CTE courses  
not enrolled in CTE courses

non-CTE graduates  
CTE graduates

The people of Maryland are our greatest asset, and our continued economic strength depends upon our ability to invest in them and prepare our children today for the jobs of tomorrow.

—Governor Martin O'Malley

**CTE Graduates, by Career Cluster**



CTE isn't offered only in secondary schools. Last year, more than 55,000 community-college students were enrolled in a CTE course, and 3,600 completed a CTE program.

## The Way Ahead

Career and Technology Education is a priority for Governor Martin O'Malley. He established the P-20 Leadership Council last year to create an integrated, statewide system that better prepares students for 21st-Century jobs and boosts the state's economic competitiveness. Part of that work is identifying and filling any gaps between CTE and STEM program benchmarks and the state's workforce needs.

The State Department of Education will encourage more school systems to adopt state-endorsed CTE programs, which were developed with higher education, government, industry, and labor, and which allow students to take advantage of articulation agreements with several of the state's two- and four-year colleges. The Department is also collaborating with school systems, business, and industry to develop and expand CTE programs in high-demand careers, such as those in the STEM disciplines. And, finally, the Department will support more career-exploration programs and resources for students transitioning from middle to high school. ■

While students generally enroll in a CTE program in 10th or 11th grade, career exploration begins far earlier. In middle school, students participate in career-awareness activities—for example, field trips, job-shadowing, interest inventories—and develop high school plans, mapping out academic coursework and career options.

For more information about Maryland's Career and Technology Education programs, go to:

[www.MarylandPublicSchools.org](http://www.MarylandPublicSchools.org)

Click first on **Divisions** and then on **Career Technology and Adult Learning**

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