Career Technical Education Framework for California Public Schools

Grades Seven Through Twelve

Adopted by the California State Board of Education
Published by the California Department of Education
Sacramento, 2007

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Developed by the
California CTE Standards and
Framework Advisory Group

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The framework was developed by the California CTE Standards and Framework Advisory Group. (See pages vii–ix for the names of the members of the advisory group and others who made significant contributions to the framework.)

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Notice

The guidance in the *Career Technical Education Framework for California Public Schools, Grades Seven Through Twelve,* is not binding on local educational agencies or other entities. Except for the statutes, regulations, and court decisions that are referenced herein, the document is exemplary, and compliance with it is not mandatory. (See Education Code Section 33308.5.)

Contents

A Message from the State Superintendent of Public Instruction and the State Board of Education

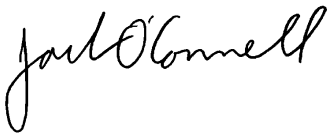
The California Department of Education and the California State Board of Education are pleased to present the *California Career Technical Education Framework for California Public Schools, Grades Seven Through Twelve.* The framework is a guide for implementing the *California Career Technical Education Model Curriculum Standards, Grades Seven Through Twelve,* adopted by the State Board in 2005 and published by the Department in 2006. It serves as a how-to manual for teachers, school and district administrators, curriculum specialists, and school boards in developing standards-based career technical education (CTE) pathways, courses, curricula, and assessments. It demonstrates how curricula can be integrated to provide our students with rigor and relevance in both academic and CTE knowledge and skills. The CTE standards are recognized as a model for excellence throughout California, in many other states, and even in other countries. This eagerly awaited CTE framework will continue the impressive improvements under way throughout the CTE system and will be a key tool in improving CTE in our middle schools, high schools, regional occupational centers and programs, and adult education programs.

In today's world CTE is important so that our children can understand responsibility; learn what is required to get and keep a job; receive information about and gain experience in careers of interest; and make informed choices for postsecondary education and life. All of California's students need knowledge and skill for success in postsecondary education and employment and need to be prepared to make choices and manage their careers throughout their lifetimes. The CTE model curriculum standards and the CTE framework provide the foundation and strategies for designing educational programs that make these important goals possible.

This document also makes evident that rigor in CTE must be derived from two primary sources, academic knowledge and skill and industry-specific workplace knowledge and skill. Academic rigor is found in the application of academic concepts as they relate to the understanding of and practice in a particular industry. Workplace rigor is found in the knowledge and skill necessary for students to achieve, maintain, and advance in employment in a particular industry. The level of academic and workplace rigor is a function of the degree to which each CTE program prepares its youths for high-skill, high-wage, or high-demand careers. If we want our children to become successful citizens in the twenty-first century, we as a society have to provide the means and the environment for them not only to develop academically but also to become productive members of society. As the

global economy has eliminated boundaries in commerce, it is time to eliminate those barriers in education that prevent too many of our children from fulfilling their potential.

Linking rigorous curricula to real-world skills enhances learning, no matter what direction students take. California's students deserve the advantage that early consideration of career choices and preparation for tomorrow's workforce and economy can provide. Please join us in this mission to provide California's youths with the crucial advantage of rigorous and relevant career preparation.



JACK O'CONNELL
State Superintendent of Public Instruction

KEN NOONAN
President, California State Board of Education

Acknowledgments

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Note: Titles and locations of all persons listed in the Acknowledgments were current when this document was being prepared.

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Through a competitive-bid process, the California Institute on Human Services (CIHS), Sonoma State University, was selected to manage the CTE standards and framework development process. The contractor worked collaboratively with the CTE Advisory Group, the California Department of Education's CTE Project Team, the Framework Review Committee, and 15 Framework Technical Writing Teams to develop a quality framework. Staff from CIHS included the following: Tony Apolloni, Director; Mary Grady, Publication Specialist; Jill Martin, Support Staff; Nara Nayar, Project Coordinator; Ivy Smith, Special Consultant; George Triest, Associate Director; Lynne Vaughan, Consultant; and Eileen Warren, Principal Investigator.

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Introduction

In 2004 State Superintendent of Public Instruction Jack O'Connell stated the following:

> The job of K–12 education in California must be to ensure that all our students graduate with the ability to fulfill their potential—whether that takes them to higher education or directly to their careers. Unfortunately, . . . too many of our students are not adequately prepared for either. By raising our expectations for our students, we can and will begin to change that.[1]

The *California Career Technical Education Model Curriculum Standards, Grades Seven Through Twelve,* adopted by the State Board of Education (SBE) in 2005, was designed to help achieve that goal by providing educators with rigorous, balanced standards reflecting both the essential knowledge needed to achieve a seamless transition to careers or postsecondary education or training and the specific skills required for each of the state's 58 career pathways.[2]

This publication, the *Career Technical Education Framework for California Public Schools, Grades Seven Through Twelve,* is the blueprint for educators to use in implementing the career technical education (CTE) model curriculum standards adopted by the SBE. It provides a context for the content laid out by the standards, discusses best practices, and explores important issues in the implementation of those standards.

Overview of the Framework

The development and adoption of the framework were mandated by the passage in 2002 of Senate Bill 1934 (McPherson), a companion bill to the earlier Assembly Bill 1412 (Wright), passed in the same year, which required the development of the CTE model curriculum standards. The Senate bill also required that the framework be developed in consultation with an advisory group "broadly reflective" of the state. The group was to consist of persons representing business and industry, labor, the California Community College System, the University of California, the California State University, classroom teachers, school administrators, students, parents and guardians, the California Legislature, the California Department of Education, and the California Labor and Workforce Development Agency.

In response to the legislation, the State Superintendent of Public Instruction formed the California CTE Standards and Framework Advisory Group in late 2003. The Advisory Group was consulted throughout all phases of the development of the standards and framework. In April 2004 it developed the state's CTE vision and mission statements and a set of guiding principles for CTE in California. The statements and guiding principles are described as follows:

Vision Statement

Career technical education engages all students in a dynamic and seamless learning experience resulting in their mastery of the career and academic knowledge and skills necessary to become productive, contributing members of society.

Mission Statement

California's education system delivers high-quality programs, resources, and services to prepare all students for career and academic success, postsecondary education, and adult roles and responsibilities.

Guiding Principles

1. *Inclusion*—CTE provides all students with full access to high-quality offerings in career technical education.
2. *Students and the economy*—CTE serves the career preparation needs and interests of students, industry, labor, and communities while promoting workforce and economic development.
3. *Preparation for success*—CTE prepares students to master the necessary technical, academic, employability, decision-making, and interpersonal skills to make the transition to meaningful postsecondary education and employment.
4. *Career planning and management*—CTE provides students with opportunities to develop and apply the skills needed for planning and managing their careers.
5. *Integration*—CTE incorporates instructional strategies to improve teaching and learning through rigorous academic content standards applied in real-world situations.
6. *Programs of study*—CTE provides sequenced curricular pathways that include career-related and academic content standards to prepare students for success in postsecondary education, careers, and lifelong learning.
7. *Innovation and quality*—CTE fosters innovation and continuous improvement of instructional content and delivery.
8. *Future orientation*—CTE demonstrates a forward-looking perspective that meets the contemporary and emerging needs of individuals, communities, and the economy.
9. *Collaboration*—CTE partners with business, industry, labor, postsecondary education, and the community to provide classroom and work-based learning opportunities that prepare all students for success.

This framework was developed to align with the CTE vision and mission statements and guiding principles. Previous SBE-adopted curriculum frameworks were consulted to ensure that this framework would be consistent with the others. However, unlike the other curriculum frameworks, the *Career Technical Education Framework* addresses a wide range of subjects for significantly diverse stakeholder groups. It is a hands-on tool for education professionals and others

interested in implementing standards-based CTE statewide. Because the framework is the blueprint for implementing the CTE standards, a brief discussion of the conceptual model follows.

Conceptual Model for CTE Standards

John R. Anderson, a cognitive specialist at Carnegie Mellon University, theorizes that students learn through the interaction of *declarative* memory and *procedural* memory.[3] The declarative memory is where information is stored, and the procedural memory is where the production rules and processes, the data on how to use the information, reside. Anderson and other researchers believe that humans learn how to attain, use, transmit, and manage knowledge through the interaction of procedural knowledge and declarative knowledge. Therefore, standards must identify the underlying information (declarative knowledge) and processes (procedural knowledge) in a given content area to help students develop complex cognition and higher-order thinking skills.

At the Mid-continent Regional Education Laboratory (McREL), John Kendall applied Anderson's work, categorizing information and skills as declarative and procedural statements creating strong knowledge- and skills-based standards. Kendall's work in this format includes the development of standards for academic subjects, life skills, and CTE for more than ten states.[4] The CTE Advisory Group referred to Kendall's format as the *information and skills format* in writing the standards.

The information and skills format is based on the belief that all knowledge can be categorized under three domains: declarative, procedural, and contextual:

1. *Declarative knowledge* is *information,* including facts, events, concepts, and principles, that the learner needs *to know,* not what the learner needs to do. Declarative knowledge requires an understanding of component parts. For example, mastery of the standard "understand the *concept* of profit margin" requires the foundational understanding of what profit margin is built on: variable and fixed costs, gross profit, markup, and so forth.
2. *Procedural knowledge* is what the learner is able *to do* with the information. It includes the *skills and processes* important to the content area. Calculating profit margins is important to the career pathways of Marketing, Sales, and Service; therefore, one procedural standard for this content area might be "knows how to calculate profit margins."
3. *Contextual knowledge* goes beyond declarative or procedural knowledge to include information or skills that are, in part, defined by the conditions under which they are learned. In other words, contextual knowledge is *new knowledge* acquired during the act of doing something.

Take, for example, the Animal Science pathway standard D5.1: "Evaluate a group of animals for desired qualities and discern among them for breeding selection." Knowing the desirable qualities of various animals is declarative knowledge, and evaluating animals for those traits is procedural knowledge; but the

knowledge constructed in examining how those traits might combine in a breeding situation is new procedural knowledge created by the situation or context.

A knowledge and skills approach to standards development supports hands-on instruction that applies principles, concepts, skills, and processes from academic and technical curricula to real-life tasks. Standards written at the knowledge-and-skills level incorporate principles that can transfer across occupations within an industry sector. For example, in the Transportation industry sector, standard C3.3 in the Vehicle Maintenance, Service, and Repair pathway specifies that students "understand the basic principles of pneumatic and hydraulic power and their applications" and that students should apply those principles in servicing vehicles. Once mastered, the principles can be transferred to the skills needed to service aircraft in the Aviation and Aerospace Transportation Services pathway, in which the same standard is specified as A4.2.

Basic principles that apply to pneumatic and hydraulic power include the concept of proportional relationships. Thus, when students learn to diagnose the function of brakes through the lens of proportionality, they can master the skill and see the relationship between hydraulic fluid volume and the ability of the brakes to stop an automobile. That concept transfers across industries and can be applied to everyday life. For example, proportional relationships apply to the function of brakes in the Transportation industry sector and to sales tax in the Marketing, Sales, and Service industry sector. The amount of sales tax paid on an item is proportional to the cost of the item. In everyday life a proportional relationship also exists between the amount of interest paid on a home or car loan, the size of the loan, and the annual percentage rate.

An information and skills format for writing standards is a major change from the much more detail-oriented activity and performance-level standards that have been common in CTE in the past. Several of the reasons for this change are listed as follows:

1. *Standards written at the knowledge and skills level support hands-on or applied learning and help students master the skills required for immediate employment; apply conceptual knowledge to real-world tasks that require critical thinking and problem solving; and transfer knowledge across disciplines as well as across jobs, occupations, and industry sectors.*

   CTE programs should be preparing students for the following:

   a. A fast-changing, knowledge-based global economy in which program graduates may find they are competing with workers in other countries.[5] High-speed telecommunications, combined with rising levels of education, continuously expand global competition. Many higher-skill jobs and lower-skill jobs are being outsourced or moved offshore to countries where labor costs are lower and countries where workers possess a firm grasp of concepts and the ability to apply those concepts in new situations.[6, 7]

   b. Employment that requires mastery of fundamental skills, such as employability and academic and technical skills that can be applied across jobs, occupations, and industries as follows:

(1) *Across jobs.* Ninety-eight percent of all California enterprises are small businesses, which employ more than 50 percent of California's workforce.[8] Because they lack the breadth and depth of specialized staffing found in large corporations, small businesses seek workers who possess transferable skills. Furthermore, for small businesses to respond quickly to changing market demands, they need agile workers who can continually apply knowledge and skills in new ways.

(2) *Across occupations and industries.* Although the Bureau of Labor Statistics (BLS) does not attempt to project the number of career changes a person will make in a lifetime, available data do indicate that job changes, both voluntary and involuntary, are increasing. According to the BLS people born between 1957 and 1964 held, on an average, ten different jobs between the ages of eighteen and thirty-eight.[9] This trend clearly will require flexible workers able to transfer their skills.

Therefore, all students need to be able to transfer learning across jobs, occupations, and industries and be able to think *conceptually;* that is, to detect patterns and opportunities and to combine seemingly unrelated information and ideas into something new.[10] The hands-on or applied learning methodology used in CTE classrooms to teach knowledge and skills will help students transfer information and apply conceptual knowledge to tasks in a real-world setting.

2. *Broad standards written at the knowledge and skills levels adapt quickly and easily to the realities of a rapidly changing, knowledge-based economy.* Industry standards change, technological advances make previous practices obsolete, and market demands fluctuate over time. In the computing industry, for example, "Moore's Law" states that the per-unit cost of computing power doubles roughly every two years.[11] And with computers and computing becoming integrated with more and more industries, that rate of change affects the entire labor market. If standards have adequate breadth and do not dictate specific tools, programs, or methods, they will continue to be relevant and useful over time.

3. *Broad standards written at the knowledge and skills levels encompass most lower-level specific activities and tasks while reducing the total number of standards.* To spell out all lower-level skills in all pathways would be impractical. For example, standards in an Agricultural pathway may apply to rice farming, hog farming, alpaca farming, and every other farming venture; but it would take hundreds of pages to write standards that cover every farming possibility. And in the Fashion and Interior Design industry sector, standard A9.3 calls for students to master the skill of using "a variety of equipment, tools, supplies, and software to construct or manufacture garments" and does not use such discrete statements as "knows how to thread and use a needle" or "is proficient in GERBERSuite CAD and CAM applications," for example.

The SBE provides clear corroboration of the importance of detailing the knowledge and skills (instead of activities and tasks) that students need to master. In the message introducing each set of California's academic content standards, the State Board President and the State Superintendent of Public Instruction underscore the need for a specific vision of what students need to know and be able to do.

CTE Standards Versus Other Core Subject Standards

The CTE standards differ from those for academic core subjects in several ways:

1. The heterogeneous nature of the subject material and course delivery patterns makes impossible any efforts to develop course- or grade-specific standards for all CTE subjects. The content, sequencing, availability, structure, and nomenclature of CTE courses vary significantly among school districts and sometimes even among schools within a district. Although CTE courses are developed according to industry sector standards, each school offers courses that reflect the local district's employment preparation needs.
2. CTE courses are not necessarily aligned vertically. They may be obviously sequenced (e.g., Accounting I, Accounting II, and so forth). But they may also be (a) courses that draw from more than one pathway within a sector (e.g., Plant and Animal Physiology, which takes standards from the Plant Science, Animal Science, and Agriscience pathways); or (b) discrete courses that draw from a particular pathway (e.g., Introduction to Network Communications). Not all courses build on other prerequisite courses in the same content area.
3. The building blocks for CTE are, in part, the academic knowledge gained in core courses, such as English and mathematics. Success in CTE depends on how well students increase their knowledge and skills in multiple arenas within the academic core. For example, veterinary medical courses are of little use for students who lack a detailed understanding of biology; accounting courses are founded on mathematical knowledge; and the Family and Human Services pathway professions all require high-level communication skills initially fostered in English–language arts courses. CTE courses must integrate, support, and reinforce core academics to ensure that students have the academic skills they need as a foundation for CTE.

Such differences are essential to understanding the way in which California's CTE standards have been written. The knowledge and skills format used in the Kendall model moves the CTE standards away from the old, more familiar performance standards model. The adopted model instead delineates the underlying knowledge and skills that make optimum performance possible, providing a flexible foundation on which to build classroom demonstration and practice.

Structure of the CTE Standards

Industry sectors and pathways. California's CTE model curriculum standards are presented in 15 industry sectors, or groupings, of related careers and broad industries, such as the Finance and Business industry sector and the Public Services industry sector.

Each sector has two or more career pathways. Within each career pathway are identified standards detailing the knowledge and technical skills students need to succeed in the selected pathway. For example, the Building Trades and Construction industry sector contains four pathways: Cabinetmaking and Wood Products, Engineering and Heavy Construction, Mechanical Construction, and Residential and Commercial Construction. The planned sequence of courses within the pathways may be represented at the local level in a selection of rigorous academic and CTE courses that prepare students for entry-level careers and lay the foundation for more advanced postsecondary training or education related to their career interest.

The pathways are not mutually exclusive. Many industry sectors require similar knowledge and capabilities, especially in the areas of more general work and life skills. Many careers draw on knowledge and skills classified under more than one pathway or more than one industry sector. For example, becoming an architect requires mastering the elements of the Arts, Media, and Entertainment industry sector and those of the Building Trades and Construction sector. And the Information Technology sector has crossed over into virtually every other industry.

Types of standards within industry sectors. Each industry sector has two different types of standards, foundation standards and pathway standards:

Foundation standards are the 11 core standards all students need to master to be successful in the CTE curriculum and in the workplace:

1.0 Academics
2.0 Communications
3.0 Career Planning and Management
4.0 Technology
5.0 Problem Solving and Critical Thinking
6.0 Health and Safety
7.0 Responsibility and Flexibility
8.0 Ethics and Legal Responsibilities
9.0 Leadership and Teamwork
10.0 Technical Knowledge and Skills
11.0 Demonstration and Application

Although more generic than pathway standards, foundation standards reflect a pattern of high expectations for mastering the specific knowledge and skills required for the industry sector. For example, in all industry sectors, under the section titled "Problem Solving and Critical Thinking," one foundation standard reads as follows: "Understand the systematic problem-solving models that incorporate input, process, outcome, and feedback components."

Foundation standards support and extend the skills and competencies identified by the Secretary's Commission on Achieving Necessary Skills (SCANS). These 11 standards, uniform in all industry sectors, focus on the basic skills all students in that sector will need to succeed in the high-performance workplace.

Note: Their subcomponents may differ slightly.[12]

Within the foundation standards are contained those academic standards approved by the State Board of Education (SBE) for various disciplines. They are integrated with the industry sector pathways and are supported and reinforced in applied situations. Most are listed in the first two foundation standards of each industry sector, 1.0 (Academics) and 2.0 (Communications). With the exception of the English–language arts standards, which are generally listed under 2.0 (Communications), most of the academic standards appear in 1.0 (Academics) because they are broad-based enough to include most industry sector communication requirements. This approach avoids the restating of standards already approved by the SBE.

Pathway standards are concise statements that reflect the essential knowledge and skills students need for success in the career pathways. For example, Agriculture and Natural Resources C9.2 calls for students to "understand the ways in which housing, sanitation, and nutrition influence animal health and behavior"; Finance and Business A2.2 requires students to "apply appropriate concepts and techniques to account for equity investments and withdrawals for sole proprietorships, partnerships, and corporations"; and Manufacturing and Product Development D7.3 calls for students to "use computers to design and produce welded products, write numerical control programs, and control robots."

Note: All academic and CTE standards adopted by the SBE are available online at http://www.cde.ca.gov/be/st.

Structure of the Framework

The CTE standards are written for 15 industry sectors. Within those sectors separate standards have been developed for 58 career pathways. For a unique blend of big-picture analysis offset by the details of classroom instruction and pathway levels, the framework is presented in two parts: Part I, which offers extensive detail on a variety of topics applicable to all 15 industry sectors; and Part II, which highlights each industry sector with selected examples.

Part I consists of a introduction and five chapters. The introduction offers an overview of the compelling case for CTE as to its accomplishments in (1) increasing the success and satisfaction of high school students; and (2) increasing the quality and quantity of skilled workers to fuel the economy. It explores the relationship between rapidly changing workforce needs and an increasing demand for CTE, which is highly flexible and adaptable to meet those needs. The introduction also provides an overview of the current structure and funding of CTE in California, explores some of the unique qualities of CTE, and discusses the high level of support for CTE expansion and innovation.

Chapter 1, "Structuring a Standards-based Curriculum," begins with an overview of schoolwide CTE delivery structures, such as district-sponsored programs in middle schools and comprehensive high schools; regional occupational centers and programs (ROCPs); adult education; and alternative structures, such as CTE-oriented magnet and charter schools. The overview is followed by a step-by-step discussion of how to create standards-based CTE programs, beginning with sequencing courses and mapping the curriculum and culminating with the delivery of CTE through experiential activities and work-based learning.

Chapter 2, "Lesson Planning and Instruction in Standards-based Education," provides a practical guide to developing standards-based lessons and units for classroom instruction. Its primary sections are the following:

1. Creating exemplary standards-based lessons and units, which involves:
    a. Analyzing the standards
    b. Designing assessments
    c. Identifying the skills and knowledge required
    d. Planning and delivering lessons
    e. Examining students' work
    f. Using assessment data to drive instruction
2. Integrating foundation and pathway standards with lessons and units to increase rigor, including the teaching of literacy and mathematics through CTE and launching interdisciplinary projects in collaboration with academic teachers

Note: A thorough understanding of chapters 1 and 2 is necessary for navigating Part II, in which sectors and pathways exhibit sample elements of standards-based lessons and units that demonstrate how the process applies to a particular industry.

Chapter 3, "Administrative and Support Services," addresses the administrative infrastructure essential to the successful operation of a CTE program. It opens with a discussion of appropriate planning for CTE programs: who should be involved, what should be included, and how results should be incorporated into whole school plans, such as the single-site plan or the action plan of the Western Association of Schools and Colleges. Emphasis is placed on planning for financial support and using data-based internal and external reviews to ensure continuous improvement. Particularly important to creating high-quality, industry-valid, rigorous CTE course work is professional development, which is uniquely relevant to the needs of CTE staff and is explored in depth.

The crucial role of school counselors is also emphasized in Chapter 3, particularly as to proving career guidance and scheduling students for CTE. Included is a review of methods for student recruitment and marketing. A special focus on universal access for special-needs students, English learners, and students designated as gifted is followed by a review of the case for nontraditional careers. Differentiated instruction in CTE lessons and units to ensure access by all students is featured as the primary approach to CTE.

Chapter 4, "Community Involvement and Collaboration," explores the roles played by local stakeholders and partners, including the following:

- Site-based groups (e.g., school districts, administrators, teachers, parents and families, students)
- Education community (e.g., postsecondary schools, apprenticeship programs, ROCPs, adult education)
- Workforce investment boards and youth councils
- Business and industry
- Community-based organizations
- Youth development organizations
- Economic development entities (e.g., chambers of commerce, the Employment Development Department, labor market intermediaries, economic development corporations, employer associations)
- Government organizations
- Military agencies

Included in Chapter 4 is a significant discussion of articulation and alignment in CTE—middle school to high school, high school to postsecondary education, high school to industry certification—and the role of P–16 councils.

Chapter 5, "Applications of CTE Foundation Standards," discusses the ways in which classroom teachers can incorporate and apply the foundation standards in the following areas:

1.0 Academics
2.0 Communications
3.0 Career Planning and Management
4.0 Technology
5.0 Problem Solving and Critical Thinking
6.0 Health and Safety
7.0 Responsibility and Flexibility
8.0 Ethics and Legal Responsibilities
9.0 Leadership and Teamwork
10.0 Technical Knowledge and Skills
11.0 Demonstration and Application

Although all foundation standards are explored and expanded, special emphasis is placed on foundation standard 3.0, Career Planning and Management, because this essential area is rarely if ever taught in disciplines outside CTE.

Part II highlights each industry sector and presents selected examples of standards-based curriculum and lesson planning for each pathway. For each sector the elements are the following:

- A description of the sector in relation to the economy and the projected labor market
- A list of the pathways within the sector

For each pathway the elements are the following:

- A sample course sequence

- A sample of appropriate foundation and pathway standards for a single course in the pathway
- A sample of an "unpacked" standard in the sample course
- A sample authentic or project-based performance task assignment that integrates foundation and pathway standards
- A sample rubric, or scoring tool, to help assess student performance on the assignment
- A sample of pathway careers

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Part I
Career Technical Education for California's Twenty-first Century

California's economy ranks as the eighth largest in the world, preceded only by the economies of the United States, Japan, Germany, China, the United Kingdom, France, and Italy.[1] As with all other major global economies, developments in the way the world does business have demanded commensurate changes in the knowledge and skills of California's workforce. Over the past two decades, external forces—including technological advances, intensified international competition, accelerating product cycles, and growing consumer interest in quality—have created an economic environment characterized by change, variety, higher standards, and uncertainty. The keys to effective competition for students entering this labor market are flexibility, fast responses to market shifts, and continuous innovation.

Such dynamic shifts have transformed the workplace, dramatically reducing the number of lower-skill jobs that provide wages and benefits sufficient to support a family. Today, good jobs require higher-level skills, changing what workers need to know and how they apply their knowledge and limiting the long-term value of any current stock of knowledge or skills. Successful participation in the economy now requires fundamentally different skill sets, and the bar keeps rising.

In response to the demanding requirements of the new global economy, career technical education (CTE) providers at all levels, public and private, are reexamining previous ideas about the knowledge and skills needed in the workforce. In California educators have responded with the impressive knowledge- and skills-based standards adopted by the State Board of Education. For true effectiveness the change cannot stop there. Several key factors call for a bold, strategic response from the CTE community to the implementation of the new standards:

- Workplace requirements are increasing, and the rate of change is accelerating. Many living-wage jobs now demand skills that a decade ago were typically associated with positions higher on the career ladder. As Willard Daggett notes, "Jobs that were once routine and sequential have been eliminated or replaced by technology, . . . [and] businesses . . . outsource work overseas

with a high-quality, low-cost return. Medium-wage, high-skill jobs are the standards for today's global economy."[2]

- Current research indicates that CTE improves graduation rates and, in some structures, academic achievement rates.[3] However, CTE is being challenged to demonstrate added value in both academics and graduation rates and to meet the higher demands of business and industry.
- Careers in high-growth sectors increasingly involve skill sets that cut across traditional career lines. Although California's new CTE standards include foundation standards to address that shift, teachers need staff development and support to ensure appropriate implementation of CTE.
- A growing body of research supports the benefits of integrating CTE with academic instruction to improve learning outcomes, calling for a systemic movement toward overt integration, as in courses such as Biotechnology, Principles of Technology, Veterinary Science, Architectural Design, Ford Partnership for Advanced Studies, Medical Technology, and Virtual Enterprise.[4]

Background

A review of the relevant literature highlights the twenty-first century workforce requirements in light of three new challenges: (1) the need for an increase in the quality and quantity of skilled workers; (2) the need for employees who are lifelong learners and have transferable skills; and (3) the need for flexible, adaptable CTE systems:

1. *The need for an increase in the quality and quantity of skilled workers.* The demand for a highly skilled workforce is being driven by rapid technological advances. The growing importance of knowledge-based work requires preparation far beyond basic skills. Even entry-level jobs will require higher-order cognitive skills, such as abstract reasoning and problem solving.[5]

   However, a 2005 national survey of high school graduates, college instructors, and employers commissioned by Achieve, Inc., an organization of governors and industry leaders, reported that as many as 40 percent of American public high school graduates are unprepared for both college and work.[6] Preparation gaps include sloppy work habits, inability to read and understand complicated materials, and deficiencies in mathematics, science, and writing skills.

   Quantity is another burgeoning workforce issue. A recent RAND Corporation study of labor market conditions in the United States over the next ten to 15 years found that the current slowdown in workforce growth may cause difficulty for firms trying to recruit workers during periods of strong economic demand.[7] Employers will need to hire multiskilled personnel from population groups with relatively low labor force participation rates, such as the sixteen- to twenty-four-year-old age group, to replace retiring baby boomers. However, U.S. Department of Labor statistics show that the participation

rate for this age group, which includes all recent high school graduates, has been decreasing since the early 1990s.[8]

2. *The need for employees who are lifelong learners and have transferable skills.* The growing importance of knowledge-based work means that education and training will be needed throughout an employee's life. Training and retraining will continue well past initial entry into the labor market.

   Eighty-two percent of employers in the Achieve, Inc., study stated that most recent high school graduates will need further education to advance in their companies.[9] In fact, according to the U.S. Chamber of Commerce, 80 percent of the 23 million jobs to be created in the next ten years will require some postsecondary training or education or both.[10] Although jobs being backfilled may not demand the same degree of ongoing training and education, nearly all jobs will require on-the-job retraining so that employees can adapt to technology-driven job requirements that are increasing constantly.

3. *The need for flexible, adaptable CTE systems.* John J. Castellani, president of the Business Roundtable, addressed the need for flexibility in testimony before the U.S. Congress:

   > We must recognize that our training system for workers was developed for an economy that no longer exists. It was intended to help a static labor market adjust to cyclical business changes. But for today and the foreseeable future, we have a dynamic labor market that must adjust to structural economic changes.[11]

   Castellani contends that because of rapidly changing technology and international competition, CTE will need to quickly adapt programs, curricula, and instructional approaches to keep pace. Further, the 2005 Achieve, Inc., survey reported that 84 percent of recent high school graduates not in college believe that they will need to pursue more formal education or training to adapt their knowledge and skills to meet employers' ever-evolving requirements.[12]

Unique Qualities of CTE

California *Education Code* Section 51228 states that "districts are encouraged to provide all pupils with a rigorous academic curriculum that integrates academic and career skills, incorporates applied learning in all disciplines, and prepares all pupils for high school graduation and career entry." Furthermore, *Education Code* Section 51224 mandates that school district boards "prescribe separate courses of study, including, but not limited to, a course of study to prepare prospective pupils for admission to state colleges and universities and a course of study for career technical training." And Section 51228 also specifies that the last item, career technical training, should be " . . . a course of study that provides an opportunity for those pupils to attain entry-level employment skills in business or industry upon graduation from high school."[13]

Note: In prescribing "separate courses of study," The Legislature did not intend that students be directed into one of two exclusive and independent curricular paths. The intent was to describe courses of study as separate so that they would

maintain their unique qualities and ensure that school boards would not disband one set of courses in favor of another.

The California Department of Education (CDE) has incorporated those requirements into its official vision: "To create a dynamic, world-class education system that equips all students with the knowledge and skills to excel in college and careers and excel as parents and citizens."[14] Most of the academic structure across the state focuses on preparing students for college, including interventions for students in the reading and mathematics courses required to earn a high school diploma, that gateway to college success. The other 50 percent of this charge, to equip *all* students with the knowledge and skills to excel in careers, falls primarily to CTE.

Through its unique connection to the world of work, CTE offers students a powerful, authentic education and an entry point into a rewarding career. Through hands-on experience, mastery by doing, learning in context, and connections with adult mentors, CTE engages students in learning essential skills in an applied venue. By providing career exploration and work-based learning, CTE enhances students' ability to choose an appropriate major and institution for postsecondary education and training, thus increasing the students' chances of finding good jobs that lead to rewarding careers. And together with a solid career-skill foundation, CTE offers options for part-time, well-paid, career-ladder employment during postsecondary training and education.

The unique qualities of CTE include opportunities for students to (1) acquire the technical skills required for direct employment in business and industry; (2) maximize achievement through contextual learning; (3) learn to function efficiently in predictable and unpredictable circumstances; (4) experience mentorship by an adult; (5) gain employment experience and references for job applications; (6) increase potential for high school graduation; and (7) prepare for success in postsecondary training and education.

In providing such opportunities, CTE realizes the vision of the CDE and the mandates of the *Education Code*.

1. *Acquire the technical skills required for direct employment in business and industry.* As addressed in the *Education Code* mandates and the CDE vision statement, acquisition of the technical skills reflected in CTE foundation and pathway standards is one of the two primary purposes of education in the state—and practically the sole province of CTE. All students can benefit from basic technical and employability skills, whether they plan to pursue postsecondary training and education on the job; in the military; in the apprenticeship system; at a community college, adult school, or regional occupational center or program (ROCP); or at a four-year college or university. Acquiring technical skills in high school opens a world of options to students who may choose to do any of the following:
    a. Move directly into a full-time career-ladder job.
    b. Combine advanced career training with related postsecondary study.
    c. Maintain career-ladder part-time work while continuing in postsecondary education.

d. Enter the workforce after postsecondary education with marketable skills.

These options all provide an advantage to a student who has acquired CTE skills in high school in comparison with a student who has not. They also directly address the growing problem of "reverse transfers," referring to those students earning a four-year degree who have to return to a community college to gain marketable skills.

2. *Maximize achievement through contextual learning.* CTE relies on contextual learning, a method of teaching the skills employers value and on which students thrive. Contextual learning incorporates academic applications, appropriate work habits and attitudes, and specific career skills in an environment that simulates or incorporates real-world employment. Teaching those skills in the context of a career is effective in engaging hard-to-reach students and motivating them to master mathematics, written and oral communication, critical thinking, and problem-solving skills.[15] Learning within a career-related context imbues abstract concepts with the relevance and application that make them accessible to context-driven learners. In turn it helps students become confident in their ability to master the standards at school and on the job. And when students experience success in their endeavors and discover the applicability of abstract thinking to the "real world," they develop enthusiasm for and interest in their goals—and education that will help them achieve those goals.[16]
3. *Learn to function efficiently in predictable and unpredictable circumstances.* Children as young as those in the third grade can identify and sort tasks into real work and schoolwork. One criterion for the sorting process is the predictability of school tasks, which are usually structured by the teacher and confined to a limited environment, are dependent on materials provided or clearly described, are executed on a timeline, are free of financial commitment, and are evaluated by a single, known individual. However, the real world seldom functions in that way. Although employers value consistency and reliability in their workforce, those qualities seldom describe the work itself, which tends to be messy, erratic, and swiftly changing to meet the demands of consumers and economic survival. Most of the educational system barely touches on the skills students need to function efficiently in unpredictable circumstances: to deliver rush orders and meet crash deadlines, identify or create needed job materials, or produce goods and services within budget constraints. Such skill sets reside in the realm of CTE.
4. *Experience mentorship by an adult.* CTE classes and such work-based learning programs as community classrooms or internships can connect adolescents with a caring adult, one of the strongest methods of increasing resiliency for at-risk youths.[17] Work-based mentors help young people build self-esteem and confidence and avoid or untangle the complex peer-group entanglements of drug use, gang membership, and other self-destructive behaviors. Often, they model methods of overcoming barriers through application and hard work

and serve as personal coaches for the students, reinforcing social goals and plans for reaching those goals. They also provide advice that adolescents may accept more favorably from a mentor than from a parent or teacher. CTE and work-based learning establish a environment for mentoring in which an adult supervisor has a stake in the success of the student.

5. *Gain employment experience and references for job applications.* Even for entry-level jobs, almost three-quarters of employers regularly seek information on an applicant's employment experience and references.[18] A school-based internship or CTE cooperative work model gives students an opportunity to acquire both. CTE work-based learning also offers youths a trial period during which they can demonstrate their potential. Without such a trial period, some students may become victims of negative stereotypes held by employers. Many employers use informal mechanisms for hiring rather than formal advertising, screening, and interviewing. Therefore, the connections that CTE teachers can provide may make the difference between a student being employed in a career-ladder position and merely being employed. Often, CTE teachers can link their students with employers because of relationships the teachers have built over the years. Those relationships allow teachers to connect exceptional students with exceptional employers and convince employers to try out a student who may have encountered problems in the school or in the community.
6. *Increase potential for high school graduation.* The estimated cost to a high school dropout—and the commensurate loss in contributions to society as a whole—is a loss of $304,555 in lifetime earnings in comparison with those of a high school graduate and a loss of $1,416,476 in comparison with the earnings of a college graduate.[19] Therefore, the lost lifetime earnings for the class of 2005 in a high school with 500 seniors and a 40 percent dropout rate is more than $60 million. Clearly, the stakes are high for the student and the economy as to high school graduation. School-related factors associated positively with school performance and completion rates include direct, individualized tutoring and support for the students to complete homework assignments, attend class, and stay focused on school; participation in CTE classes; and participation in community-based work experience programs.[20] The last two factors demonstrate the relationship between CTE and the increased potential for high school graduation.
7. *Prepare for success in postsecondary training and education.* The California CTE standards have received national acclaim for their focus on rigor and relevance, higher-level thinking skills, problem-solving skills, and preparation for postsecondary training and education. CTE prepares students for success in their postsecondary endeavors in four distinct ways:
    a. Providing rigorous and relevant entry-level and intermediate-level knowledge building and skills training for California's primary career pathways

b. Providing career awareness, exploration, and experimentation through counseling and guidance activities (such as career fairs, the Real Game, the California CareerZone, and Virtual Enterprise) and work-based learning opportunities (such as job shadowing, entrepreneurial activities, apprenticeships, work experience, and internships)
c. Building team skills and leadership skills through youth organizations and hands-on group projects
d. Offering students insight into the importance of postsecondary training and education to their future career success

As noted previously, the CDE's vision statement calls for California to "create a dynamic, world-class education system that equips all students with the knowledge and skills to excel in college and careers and excel as parents and citizens." CTE is the best mechanism California schools have to equip all students in kindergarten through grade twelve (K–12) with the knowledge and skills necessary to excel in careers, whether those careers are initiated right after high school or on completion of postsecondary education and training. California's vision recognizes the primacy of preparation for careers in the role of the K–12 system.[21]

Structure of CTE in California

To carry out the mandate for "a course of study for career technical training" and realize the vision of a balanced educational experience that "equips *all* students with the knowledge and skills to excel in college and careers," CTE programs throughout the state have evolved into the following: (1) middle school introductory CTE courses; (2) high school CTE courses, stand-alone or sequential; (3) regional occupational centers and programs (ROCPs); (4) integrated academic and CTE programs, such as magnet schools and academies; and (5) Tech Prep/2+2 programs.

Generally, integrated academic and CTE programs and Tech Prep/2+2 programs incorporate some of the course work from high school CTE courses and from ROCPs.

1. *Middle school introductory CTE courses.* Many California middle schools offer a variety of CTE courses ranging from sampler classes lasting eight to 12 weeks to full first-year courses in a particular field. By beginning their CTE exploration as early adolescents, students can experience CTE's hands-on educational opportunities while trying out various industry sectors they may choose to pursue in high school.
2. *High school CTE courses, stand-alone or sequential.* Most comprehensive high schools offer a range of stand-alone and sequenced CTE courses, including traditional classes, such as construction or automotive repair, and recent additions, such as biotechnology and digital media studio. These courses vary dramatically from district to district as to the number, types, titles, and curricula offered. School districts support their CTE courses financially through general funds and a modicum of state and federal appropriations and/or discretionary funds.

3. *Regional occupational centers and programs.* Initiated in 1967 to serve high school students and adults, ROCPs constitute the largest delivery system for CTE in California. Programs are operated regionally—by county offices of education or by districts working on their own or under joint-powers agreements—to address equipment cost and ensure that a full range of options is offered across a particular geographic area. Statewide, ROCPs offer more than 100 career pathways and programs as well as career exploration, career counseling and guidance, and job placement assistance. ROCPs work with industry or pathway-specific advisory groups to update curricula annually to address labor market needs. ROCPs received $421 million in 2005 and served about 1.5 million students, the highest enrollment occurring in Business and Information Technology and Industrial Technology.[22]
4. *Integrated academic and CTE programs, such as magnet schools and academies.* Many high school CTE programs and ROCPs have integrated core academic instruction with their courses for years, using a variety of starting points, including the following:
    a. Federal School-to-Work Opportunities Act and Smaller Learning Communities programs
    b. California Partnership Academies and Specialized Secondary Programs
    c. CTE courses that meet the academic requirements for high school graduation or a–g admission requirements of the University of California (UC) and the California State University (CSU)

    Federal funding for charter schools has increased the number of career magnet schools using a highly integrated curriculum structure.
5. *Tech Prep/2+2 programs.* Tech Prep programs also work to integrate academic and CTE programs. Combining at least two years of high school CTE and academics with two years of postsecondary education ("2+2"), Tech Prep is designed to provide maximum preparation for higher-wage employment or continued education.[23] More than 75 Tech Prep consortia, consisting of high schools, community colleges, ROCPs, businesses, and industries, operate across California and usually are administered by community college districts. Primary funding comes from federal sources.

Status of CTE in California

Six key indicators that demonstrate CTE's increasingly important role in California's high school reform efforts, building on the unique characteristics of CTE and the state's economic environment, are the following: (1) strong legislative support for CTE; (2) increased student interest in CTE; (3) increased academic and community interest in CTE; (4) increased business support for CTE; (5) greater access to funding and resources for CTE; and (6) UC and CSU support for CTE.

1. *Strong legislative support for CTE.* In 2002 California's Assembly Bill 1412 (Wright) and Senate Bill 1934 (McPerson) mandated that a CTE Advisory

Group oversee the development of the CTE curriculum standards and framework, thus granting CTE the same status as the core academic subject areas and the arts. The resulting standards, adopted by the State Board of Education in May 2005, emphasize both academics and technical skills in a higher-order knowledge and skills base. The standards have been recognized by educators across the nation for their reflection of the realities of the twenty-first century labor market, their flexibility and adaptability to local CTE conditions, and their focus on increased rigor in CTE.

2. *Increased student interest in CTE.* CTE enrollment has shown a modest upturn. Although California Department of Education (CDE) data show CTE enrollment decreasing by approximately 25 percent between 1987 and 2003, ROCP enrollment increased by more than 50 percent during approximately the same period.[24] The CDE's data from 2003–04 show that 42 percent of high school students were identified as CTE "concentrators" because they were enrolled in CTE courses beyond the introductory level and had completed at least three courses in a single CTE area. This statistic reflects a national trend; that is, the proportion of high school graduates who concentrated in a CTE area and the ratio of CTE credits to total credits remained the same between 1994 and 1998.[25] Renewed interest in CTE may be due in part to the growth of magnet schools and smaller learning communities.
3. *Increased academic and community interest in CTE.* CTE is experiencing a renaissance of interest in a growing number of thematic schools, including charter schools, smaller learning community pathways, and career academies. Because many of these schools have substantial waiting lists for enrollment, this trend places CTE in a new perspective as a focal point for entire educational structures. Between 1982 and 1998 the percentage of CTE concentrators declined from 34 percent to 25 percent, those completing a college preparatory course increased from 9 percent to 39 percent, and those with general education preparation declined from 58 percent to 43 percent.[26] These data suggest that the percentage of students combining a CTE concentration with a college preparatory curriculum increased from less than 1 percent in 1982 to almost 7 percent in 1998[27]—an increase that may reflect the development of these new CTE-focused structures that combine academic and CTE studies.[28]
4. *Increased business support for CTE.* Much of the renewed community interest in CTE comes from businesses. The growing gap between the demand for and supply of skilled workers is no secret. Because a trained and skilled workforce is essential to a thriving national economy, the business community has turned to CTE to build the foundation for a highly skilled workforce. Indicators of that support are found in the ways in which businesses have responded to the call for consultation through advisory groups and have embraced local internships, career-technical student organizations (CTSOs), community classroom placements, and other forms of work-based learning.[29]

5. *Greater access to funding and resources for CTE.* The 2005–06 Governor's Budget called for expanded CTE opportunities for middle school and high school students and improved the linkages between the career and technical curricula of the public schools and community colleges. To achieve those objectives, Senate Bill 70/2005 (Scott) provided $20 million to the California Community Colleges, to be used for several types of projects:
   a. "Quick Start" Partnerships to enhance the linkages and pathways between secondary schools and selected economic and workforce development initiatives in place at community colleges
   b. Projects that will increase program capacity and infrastructure
   c. Projects that will strengthen CTE sectors at the secondary school level

   In addition, total financial support for CTE grew to over $555 million in 2004-05: $387 million from state funds, including ROCP funding; and the balance from federal funds, primarily under the Carl D. Perkins Act.[30] One-time funding for CTE in California's 2006–07 budget continued this trend of increased financial support.
6. *UC and CSU support for CTE.* Approval for a–g credit for academically rigorous CTE courses has increased dramatically in recent years, allowing CTE courses to satisfy academic admissions requirements of universities. CDE reports show that the number of CTE courses approved by UC to satisfy the a–g requirements continues to increase. Approximately 5,000 CTE courses were approved for a–g credit in 2006.

Conclusion

In California CTE is a relevant, important educational route to success. Research shows that rigorous CTE course work combined with challenging academic classes leads to students being better prepared for success, both in the world of work and in postsecondary education and training, than were many of their peers having only academic preparation.[31] When schools provide serious preparation in both CTE and academic skills, the CDE's definition of CTE as "a program of study that involves a multiyear sequence of courses that integrates core academic knowledge with technical and occupational knowledge to provide students with a pathway to postsecondary education and careers" is fulfilled.[32]

California now faces a twofold call to action: (1) to ensure that every CTE class and program meets the State Board of Education's rigorous new standards for high-quality, integrated CTE course work; and (2) to inform the public and the stakeholders in middle schools, high schools, postsecondary education and training, and business and industry that CTE presents an educationally and economically sound choice for all students.

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Chapter 1

Structuring a Standards-based Curriculum

Career technical education (CTE) delivery structures, dependent on the availability of local resources, the needs of students, and the requirements of the business community, vary significantly throughout the state. Typical patterns for CTE delivery in middle schools, comprehensive high schools, regional occupational centers and programs (ROCPs), alternative high schools (magnet or thematic, charter, and continuation), and adult education programs are discussed briefly in this chapter.

Schoolwide CTE Program Structures

Middle schools. Decades of research have established that the middle years are a time of exploration for early adolescents.[1] That spirit of exploration is captured in CTE courses specifically designed for initiating targeted career exploration in middle schools. By planting the seeds of career preparation at the middle school level, districts can capitalize on students' motivation to increase the number of students completing the ninth grade. An aspiration to take more CTE courses and focus on a career goal can help students emerge from this crucial grade span and continue through to high school graduation. The importance of cohesiveness in the years from middle school to community college has been recognized in the work of the California P–16 Council.

Middle schools in California currently offer two types of introductory CTE courses: (1) a sampler or "wheel" course of CTE; and (2) full-year, single-focus foundation courses. The first approach includes a quarter, trimester, or semester of various CTE pathway courses, such as an introduction to computer operations, foundation skills in nutrition and foods, or the fundamentals of agriculture. By sampling a number of such courses in middle school, an early adolescent gains an experiential base on which to make reasoned choices from among high school courses. The alternative, full-year foundation courses, is usually offered after middle school students have been sufficiently introduced to career planning that enables them to identify their initial career interests. The yearlong core foundation course allows them to try out that initial interest to determine whether it might be a pathway for continued study. Middle school yearlong courses help build CTE programs at the high school level because they provide the foundation for early entry into concentration course work.

Comprehensive high schools. Comprehensive high schools, designed to address the needs of all students, usually provide career guidance programs in addition to academic and CTE courses. Although CTE courses are generally offered as

electives, some schools, such as 2005 Exemplary CTE Award recipient Yosemite High School in Madera County,[2] require students to complete a certain number of CTE units to ensure that all graduates are prepared for the world of work. Collaboration between high school CTE programs, local ROCPs, and community colleges provides a combination of useful and rigorous offerings for local students. And course work is frequently supplemented through relationships with local businesses, other educational institutions, and student organizations.

CTE in comprehensive high schools is flexible, ideally allowing students to sample several different career tracks during their high school experience. High schools with CTE courses authorized as UC/CSU a–g requirements can entice students into CTE who might otherwise miss the opportunity. For students entering secondary schools without previous exposure to CTE, some high schools offer a sampler or wheel program at the ninth-grade level.

Regional occupational centers and programs (ROCPs). ROCPs, which constitute the state's largest workforce preparation system, deliver services under the governance of county offices of education, joint partnership agreements, or individual school districts. They are locally accountable and have required advisory groups for each program.

The 73 ROCPs in California provide almost 500,000 high school and adult students with higher-level CTE so that students can (1) enter the workforce with skills and competencies to succeed; (2) be prepared to pursue advanced training in institutions of higher education; or (3) upgrade existing skills and knowledge. ROCP programs build on introductory courses to provide concentration and capstone or advanced skill building.[3] A *concentration course* is a CTE course beyond the introductory level that is intended to provide more in-depth instruction in and exploration of a specific industry sector. A *capstone course* is the final course in a planned sequence of courses that provides a rigorous and intensive culmination of a course of study. In recent years an increasing number of ROCP courses have been designed to satisfy the a–g admission requirements of the University of California and the California State University.

In addition to specific career pathway skills and comprehensive career education, ROCPs also offer employment survival skills in targeted industry sectors, placement assistance, counseling and guidance services, and other critical support services. Statewide, ROCPs collaborate with businesses and industry organizations, public and private agencies, and labor associations to develop industry-based curricula and offer instructional classes and programs to meet the needs of local business and industry.

Students sixteen years of age or older or in the eleventh or twelfth grade receive training in a variety of venues—from high school classes to business and industry facilities. ROCPs may offer courses throughout the regular school day, in the late afternoon and evenings, or during the summer months. They also award certificates of completion and/or state or national industry-based certification upon successful completion of courses. For example, in the Health Science and Medical Technology industry sector, ROCPs might offer courses and prepare students for examinations leading to Nurse Assistant certification, Vocational Nurse

licensure, Dental Assistant registration, Phlebotomy certification, and Pharmacy Technician certification. And in the Hospitality, Tourism, and Recreation sector, ROCP courses prepare students for the National Restaurant Association's ServSafe certification examination, which is required of all food service managers and recommended for all food service staff.

A study funded by the California Department of Education shows that ROCP students have higher pay, earn more promotions on the job, stay in school longer, and attend postsecondary schools at the same rate as students who do not take ROCP courses.[4] ROCPs also serve the employment training needs of eligible CalWORKs recipients.

Alternative high schools: magnet or thematic, charter, and continuation. Some school districts offer magnet or thematic high schools of choice focusing on one or more industry sectors and allowing the CTE perspective to be woven into all aspects of the curriculum. Because of their specialization magnet schools may also be able to offer more concentration and advanced courses within their chosen industry sectors or career pathways than a comprehensive high school is able to do. For example, students at Clark Magnet High School in Glendale, a 2005 Exemplary CTE Award recipient, can pursue one of four strands: Math/Science and Engineering, Technology Systems, Computer Applications, and Digital Arts. Each strand has multiple options and electives. Additionally, the core focus on technology and science allows the school to integrate applied, project-based thematic material into all courses.

Charter schools, public schools created by a community or school district, are defined primarily by their charter, the statement of goals and procedures approved by the sponsoring district or the state. Because they are not subject to some of the regulations applicable to other public schools, charter schools have more freedom to experiment with innovative programs and ideas. For example, Mare Island Technology Academy (MIT) High School in Vallejo is a 2005 Exemplary CTE Award recipient focused on technology. One unique feature of this school is that every student is required to complete an internship before graduation.

Continuation high schools are a form of alternative public schooling for students at risk of not completing their education. CTE is particularly valuable for continuation and other alternative education students who have already fallen through the mainstream cracks and may have more difficulty in securing and keeping jobs after high school or finding success in postsecondary education and training. Garfield High School in San Diego, a state model continuation high school, strongly emphasizes CTE and lifelong learning in a variety of career preparation options.

Adult education. The California Adult Education Program offers lifelong educational opportunities through school districts and county offices of education. It addresses the unique, evolving needs of individuals and communities by providing adults with the knowledge and skills necessary to participate effectively as productive citizens, workers, and family members. Approximately 15 percent of adult education funding supports CTE and apprenticeship programs. Specific CTE programs are offered on the basis of the needs of the community, the priority of CTE in the local adult education system, and the resources available.[5]

Specialized Delivery Models Within Schools

In addition to using schoolwide program structures, CTE frequently delivers programs through specialized structures within schools, such as career academies and Tech Prep programs.

Career academies. Although they very greatly across the state, career academies are usually small learning communities consisting of a cadre of students who take academic and CTE classes together with a team of teachers from different disciplines for at least two years. They typically integrate a career focus, such as health, law, or education, with the academic curriculum in a way similar to the practice in magnet schools. In addition, they develop partnerships with employers, the community, and local colleges and may require completion of activities, products, or courses beyond those their host high school mandates for graduation.[6]

The continuing increase in the number of career academies in California is fueled by three sources:

1. The federal Smaller Learning Communities Program grant that assists larger schools in reorganizing to produce a more personalized environment
2. The highly successful school reform model from Johns Hopkins University: Talent Development High Schools with Career Academies
3. The California Department of Education's California Partnership Academies grant program, which includes close to 300 academies

Much like minimagnet schools within the comprehensive high school setting, career academies address local labor market needs and are supported by local employers, who serve as advisers, mentors, and speakers and provide such opportunities as field trips, internships, and entry-level jobs. The academy structure allows students to focus on specific industry sectors and try on the career they are considering.

Career academies have well-established, positive outcomes: increased attendance; fewer behavioral problems resulting in administrative actions, such as suspensions; increased graduation rates for both at-risk and other students; and increased transition to postsecondary education and training.[7] Many of these benefits accrue from the small size, individualized instruction, counseling by teachers, career focus, and looping (teachers staying with students two or more years) that characterize these programs. Many larger schools are moving toward career academies to increase graduation rates without a major increase in demands on school resources.

An excellent example of a career academy is the Lassen Technical Institute (LTI) on the Lassen High School District campus. LTI was a showpiece for Lassen High School's 2005 Exemplary Career Technical Education Award and was the recipient of the 2000 Golden Bell Award for its integrated technical program. The course sequence shown in the following chart demonstrates that integration. Courses designated LTI have a curriculum crafted to reflect the high school's transportation focus as California's academic content standards are delivered. (Physical education and science are taken outside the academy.)

Tenth grade	Eleventh grade	Twelfth grade
English 10, LTI	English 11, LTI	English 12, LTI
World History, LTI	U.S. History, LTI	Civics and Economics, LTI
Algebra I or Geometry, LTI	Geometry, LTI, or Algebra II	Technical Mathematics
Energy and Transportation	Advanced Technology Auto, Auto Body, ROP Diesel, Computer Maintenance, ROP Computer Networking, Auto Parts Supply (choice of two)	Advanced Technology Auto, Auto Body, ROP Diesel, Computer Maintenance, ROP Computer Networking, Auto Parts Supply (choice of two)
	Mentoring/Job Shadowing	Mentoring/Job Shadowing

State-funded California Partnership Academies, such as LTI, serve students in grades ten through twelve and are required to enroll high-risk youths to make up at least 50 percent of their student body. Successful grantees receive funding for planning and implementation.

Tech Prep programs. Tech Prep is a high school to college/apprenticeship educational strategy that creates a practical connection between academic experience and career goals, particularly in technical fields. More specifically, a Tech Prep program is defined as a program of study that:

1. Combines a minimum of two years of secondary education (as determined under state law), with a minimum of two years of postsecondary education in a nonduplicative, sequential course of study, or an apprenticeship program of no less than two years following secondary education instruction
2. Integrates academic and career and technical education instruction and utilizes work-based and work site learning experiences where appropriate and available
3. Provides technical preparation in a career field, including high-skill, high-wage, or high-demand occupations
4. Builds student competence in technical skills and in core academic subjects (as defined in section 9101 of the Elementary and Secondary Education Act of 1965), as appropriate, through applied, contextual, and integrated instruction in a coherent sequence of courses
5. Leads to technical skill proficiency, an industry-recognized credential, a certificate, or a degree in a specific career field
6. Leads to placement in high skill or high wage employment or to further education
7. Utilizes career and technical education programs of study to the extent practicable[8]

The Tech Prep curriculum structure focuses on grades nine through sixteen. Therefore, implementation requires collaboration and regular communication with local postsecondary institutions. Most programs also involve partnerships with business and community leaders. Tech Prep is often implemented in conjunction with career academies.

CTE Program Planning

CTE course sequencing is the process of developing at least two sequential courses in each CTE program offered by the school. A preferable sequence format has at least three courses in each program, adding a capstone or advanced course to (1) an introductory and concentration course; or (2) two concentration courses.

Creating course sequences is inherent in the Perkins legislation. Although the sequencing previously described is similar for most CTE programs, the course content will vary according to local needs, circumstances, size of program, ability to attract highly qualified teachers, and availability of support resources. Assessing community and business needs is also an important step in planning course sequences. The partners discussed in Chapter 4 can be of significant assistance in this assessment.

One key factor in planning is the number of CTE industry sector teachers available at the school. For example, a course sequence for a CTE Agricultural Mechanics program at a high school with only one Agricultural Mechanics teacher might consist of three courses:

Grade level	Course (level and number of sections)
9–10	Agricultural Mechanics I (introductory class; teacher has two sections)
10–12	Agricultural Mechanics II (concentration class; teacher has two sections one year, one in the alternate year)
11–12	Advanced Agricultural Mechanics (capstone/advanced class; teacher has one section one year, two in the alternate year)

A different school, with two teachers in the sector, might offer many more options, even several that fulfill university admissions requirements as well, as shown in this example for one Agricultural Science and one Agricultural Business teacher:

Grade level	Course (level and number of sections)
9–10	Introduction to Agriculture (introductory class; teacher has two sections)
10–12	Agricultural Biology (concentration class; teacher has two sections; meets science a–g standards and high school science graduation requirement)
10–12	Floriculture (concentration class; teacher has two sections)
10–12	Environmental Horticulture (concentration class; teacher has one section; meets elective a–g requirement)

Grade level	Course (level and number of sections)
10–12	Animal Science (concentration class; teacher has one section; meets elective a–g requirement)
10–12	Plant Science (concentration class; teacher has one section; meets elective a–g requirement)
12	Agricultural Economics (capstone/advanced class; teacher has one section; meets elective a–g requirement and high school graduation requirement)

By alternating or cycling offerings over a two-year period, even more concentration courses could be added in the Agricultural Science and Agricultural Business program cited previously. The key element is that the courses themselves are carefully designed (1) to respond to local industry needs (e.g., in some areas plant science concentrates on fruit trees, in others on vineyards or forage crops); and (2) to provide students the opportunity to master the CTE standards. Because a wide range of courses often becomes the responsibility of just one or two CTE teachers, ongoing professional development and opportunities for communication with industry leaders are clearly important.

Course sequences at the local level are not the same as the pathways in the standards because local CTE programs are designed to meet local needs and circumstances. A small high school may have just one agriculture teacher, as in the first example, and that one teacher must address a number of different elements from the standards, including both Agricultural Science and Agricultural Mechanics, to provide appropriate preparation for postsecondary study, training, or job placement. The resulting site-level sequence is an amalgam of several industry sector pathways.

Furthermore, CTE courses in California do not have the same titles from district to district or county to county, and ROCP titles do not necessarily match district titles. For example, all of the following and more are titles for Agricultural Science concentration and capstone courses, most of which share common standards in differing combinations: Agricultural Biology, Botany, Plant/Animal Physiology, Agricultural Science, Agricultural Leadership, Floral Design, Agricultural Science 2, Landscape Design, Veterinary Science, Agricultural Computers, Environmental Science, Equine Science, Meat Processing, Ornamental Horticulture, Floriculture, Integrated Agricultural Science 2, and Farm Management.

Finally, CTE course sequences often include academic courses critical to and sometimes prerequisites for success in the CTE program. For example, biology is clearly essential to success in concentration courses in the Health Science and Medical Technology industry sector; and advanced academic courses, such as anatomy and physiology, may be required as corequisites for CTE capstone courses.

Logical and Coherent Sequences of CTE Courses

Course sequences are a traditional model of CTE delivery. This model is evolving as high schools reassess their obligation to prepare every student for success in the world of work. If the sequences are inclusive, they can be effective. That is, both gifted and special education students from all cultural and linguistic backgrounds are able to participate successfully.

Some high schools are experimenting with new, more rigorous requirements for course sequences. For example, a school wishing to provide students with a strong foundation in an industry sector or career pathway through the course sequence model might define successful completion of a career course sequence as follows:

The student:

1. Completes career awareness and exploration activities between grades eight and twelve
2. Completes at least one of the following course options:
   a. Graduates from a career academy
   b. Earns a C or better in a college course in an industry sector as approved by the counselor
   c. Completes one or more CTE high school or ROCP courses in an industry sector
   d. Completes career preparation activities spelled out in the individual education program
3. Completes the school's required senior project in English 12 on a topic related to an industry sector
4. Completes the school service-learning requirement in an area related to an industry sector

In this inclusive CTE pathway model, students with very diverse backgrounds and educational needs can all participate successfully and meaningfully.

Coherence in CTE is enhanced by sequenced courses creating clear CTE programs at a school site. A solid, traditional program sequence in CTE may be defined as an introductory course (which may be offered at the middle school level) followed by two or more concentration and/or capstone courses. (Part II presents examples of sequenced programs in each pathway.)

Advantages. This coherent sequence of courses will allow students to move through introductory, concentration, capstone, and related courses in an organized manner that:

1. Facilitates student mastery of many—and perhaps most—standards within a pathway
2. Allows students to select related courses from another program in the industry sector
3. Enables students to complete concentration courses that have been articulated with the community college in a Tech Prep 2+2 pathway

4. Provides opportunities in many industries to earn certificates of mastery, college credits, and/or industry certification
5. Avoids using concentration course time to teach knowledge and skills appropriate to introductory courses

Most high schools have a sequence of CTE courses within a career pathway that includes some listed courses being taught and others that are on the books; that is, they have been approved but are not being offered. All elements of a CTE sequence should be made available to students in articulated, comprehensive programs.

Reviewing the course sequence in each program is the first task in creating a standards-based curriculum to ensure that:

- There is at least an introductory and a concentration course in each program.
- All courses are offered periodically so that they are accessible to students during their four-year tenure.
- The courses collectively form a sequence reflecting rigor and high expectations for student achievement.
- The courses accurately reflect the needs of the community, local business and industry, and the students.

As described in this model, CTE coherence is fully realized in many comprehensive high schools across the state as follows:

- As part of the regular district course offerings, ROCP course offerings, or a combination
- As academy programs, such as a California Partnership Academy (grades ten through twelve) or a Career Academy (grades eleven through twelve)
- As a specialized secondary program (grades nine through twelve)

Some schools may have these fully sequenced courses in many pathways, others in just one. Alternative delivery models, such as magnet or charter schools, often offer only one pathway but provide many more concentration courses within the pathway.

Challenges. There are several challenges to creating coherent course sequences in CTE programs, including the following:

1. *The cost of establishing and maintaining facilities with up-to-date equipment,* especially for many concentration and advanced or capstone courses. The cost of computer diagnostic machinery alone can preclude a school from offering advanced Automotive Maintenance courses, for example. (For suggestions, see Chapter 4.)
2. *Difficulty in finding instructors,* particularly in high-demand fields, such as biotechnology or computer networking, which are often the areas in which students and stakeholders have the greatest interest. (For suggestions, see Chapter 3.)
3. *Time available in the master schedule.* A high school has a limited number of class periods available each year. Courses required to graduate and to meet mandates are generally scheduled first, with other courses, including academ-

ics and CTE offerings, filling in the remaining slots. If CTE is given equal status with the other courses for the remaining available periods, creating coherent course sequences should not be a problem. (For examples, see Chapter 3.)

4. *Business support.* Crucial to CTE and generally available in urban and suburban areas, business support is sometimes more difficult to generate in rural areas, especially for pathways focusing on science and technology. (For suggestions, see chapters 3 and 4.)
5. *Commitment/investment by the school and district administration.* In this era of high-stakes academic examinations, extra commitment on the part of the school and district administration is required to ensure that CTE programs can offer coherent course sequences. (For suggestions, see Chapter 3.)

These resource issues must be directly addressed in CTE planning to ensure that coherence can be maintained.

Curriculum Defined Through the Standards

Developing a standards-based curriculum for CTE is more complex than for academic courses. If instructors teach English 9, they start with the English 9 standards; and if assigned to chemistry, they address the chemistry standards. However, the CTE standards were written not to be course-specific but to reflect the following:

1. No uniform system of course structure or implementation exists across the state. A course that one district titles Child Development may cover the physical, social, emotional, and cognitive growth of a child from conception to age five in one semester. Another district with the same course title may spend a year on zero to age eighteen. Course titles like Introduction to Computers, Keyboarding I, Computer Technology, Microsoft Office, Technology I, and Business Technology may all cover essentially the same knowledge and skills or have dramatically different topic scope and sequence to meet local staffing realities or labor-market needs.
2. Although CTE foundation standards apply to the full industry sector, they tend to be more highly represented in some pathways (and thus in some courses) than in others.
3. The standards selected for any given CTE sequence are directly affected by the local community's economic situation, labor market, postsecondary opportunities, and educational needs. Thus, the courses educators create and the standards they target in those courses depend on community circumstances.
4. The interdisciplinary nature of many CTE courses requires that some curricula reflect standards from multiple pathways in a single course.

Given these realities, before CTE teachers can begin with standards-based curriculum development, they must determine which CTE foundation and pathway

standards will be addressed in each course. This approach is essential to ensuring content rigor and course continuity.

Choosing standards. Choosing the standards to be addressed takes a great deal of careful attention. Several potential difficulties are the following:

- Choosing too few course standards could indicate that the course is focused primarily on content outside the standards.
- Choosing too many standards might signal that they are being addressed in a superficial or elementary way.
- Focusing primarily on the introductory level of the standards in concentration or capstone courses would prevent students from acquiring the higher-level skills they need.
- Focusing too narrowly on pathway standards might deprive students of the chance to reinforce foundation skills.
- Choosing standards for individual courses in a department without considering the flow of standards across the department or in the coherent CTE pathway could result in inappropriate duplication of some standards and the omission of others.

One useful approach to this challenge is to create CTE sequences in industry sector groups within a district, as a collaborative of multiple districts, or as a county consortium. Inviting representatives of business and industry to participate in the process may provide substantial help and is required in some sectors and for all ROCP courses. And inviting academic teachers to join this process may also help build the foundation for ongoing collaboration. Certain industry sectors may also want to include a representative from another sector that has significant bearing on their content. For example, a teacher or a businessperson from the Information Technology sector might be helpful in Energy and Utilities discussions. (More information on involving a variety of stakeholders is included in Chapter 4.)

When teachers and supporters come together in industry sectors, they can discuss current course structure and determine which of the CTE foundation and pathway standards are addressed in their existing curriculum. They can then determine collectively which standards should be addressed in addition to or in place of current choices to ensure that (1) the rigor of the course matches the increased expectations of business and industry and the State Board of Education; and (2) courses in a pathway sequence logically build skills and allow students to master increasingly demanding standards from introductory to capstone.

In the following charts the two agriculture programs described previously are shown in relation to the choice of foundation and pathway standards targeted in each course. CTE courses tend to address many of the foundation standards in every class so that the specific foundation standards cited are those that might be targeted to be taught at deeper levels during the course. Note also that the standards for many concentration courses come from multiple pathways within the Agriculture and Natural Resources (ANR) sector (e.g., Ornamental Horticulture, Animal Science).

Agricultural Mechanics program. In the first sample program, an individual teacher must cover the most important standards in the entire Agricultural Mechanics industry.

Course	Grade level	Foundation standards emphasis	Agricultural Science pathway standards (C)	Agricultural Mechanics pathway standards (B)	Related pathway (Other topics)
Agricultural Mechanics I (introduction)	9–10	Academics 1.1, Algebra I (8–12) 10.0; Communications 2.2, Writing Strategies and Applications (9–10) 2.5; Technology 4.6; Health and Safety 6.4–6.6; Technical Knowledge and Skills 10.1	ANR C1.0; C2.0; C3.0; C13.0	ANR B1.0; B2.0; B3.0; B4.0; B5.0; B6.0; B7.0; B8.0	(small wood and metal project construction)
Agricultural Mechanics II (concentration)	10–12	Academics 1.2, Investigation and Experimentation (9–12) 1.d; Communications 2.1, Reading Comprehension (9–10) 2.2; Career Planning and Management 3.2; Responsibility and Flexibility 7.5; Technical Knowledge and Skills 10.3	ANR C13.0	ANR B1.0; B2.0; B5.0; B7.0; B8.0; B12.0	MPD (Welding): D1.0; D2.0; D4.0; D5.0; D6.0 ED (Engineering Design): C2.0; C3.0; C4.0; C5.0; C6.0 (larger wood and metal projects)
Advanced Agricultural Mechanics (ROP or 2+2 Tech Prep)	11–12	Communications 2.3, English–Language Conventions (11–12) 1.1; Problem Solving and Critical Thinking 5.1; Ethics and Legal Responsibility 8.1; Leadership and Teamwork 9.3	ANR C13.0	ANR B1.0; B2.0; B3.0; B4.0; B6.0; B7.0; B8.0; B9.0; B12.0	MPD (Welding): D3.0; D5.0; D6.0; D8.0 ED (Engineering Design): C7.0; C8.0; C10.0; C11.0 (increasingly more complex wood and metal fabrication)

Agricultural Science program. The second example, a program in the Agricultural Science pathway that includes standards from four other agriculture sector pathways, is designed for a school with a large agriculture department that can devote two teachers to Agricultural Science to meet community and student needs. The two courses in the sequence that carry full academic credit obviously address the academic standards for the area in which they are credited in addition to other foundation standards within the industry sector.

Course	Grade level	Foundation standards emphasis	Agriscience pathway standards (C)	Other pathways (A, D, F, G)
Introduction to Agriculture	9–10	Academics 1.2, Investigation and Experimentation (9–12) all; Communications 2.1, Reading Comprehension (9–10) 2.1; Career Planning and Management 3.1–3.5; Leadership and Teamwork 9.2; Technical Knowledge and Skills 10.1	ANR C1.0; C2.0; C3.0; C4.0; C6.0; C7.0; C8.0; C9.0; C10.0; C11.0; C12.0; C13.0	
Agricultural Biology[2]	10	Academics 1.2, Investigation and Experimentation (9–12) all; Communications 2.1, Reading Comprehension (11–12) 2.3; Communications 2.2, Writing Strategies and Applications (9–10) 2.6; Career Planning and Management 3.6; Ethics 8.2	ANR C5.0; C6.0; C7.0; C9.0; C11.0; C13.0	Science: Life Sciences, Substrands 1–10
Floriculture[1, 2]	10–12	Communications 2.4, Listening and Speaking Strategies and Applications (9–10) 1.7 Responsibility and Flexibility 7.6	ANR (Ornamental Horticulture): F1.0; F9.0; F11.0	ANR (Agricultural Business): A2.0; A3.0; A4.0; A5.0; A6.0; A7.0; A8.0

Course	Grade level	Foundation standards emphasis	Agriscience pathway standards (C)	Other pathways (A, D, F, G)
Environmental Horticulture[1, 2]	10–12	Communications 2.3, Written and Oral English Language Conventions (11–12) 1.2; Leadership and Teamwork 9.6	ANR C13.0	ANR (Ornamental Horticulture): F1.0; F2.0; F3.0; F4.0; F5.0; F6.0; F7.0; F8.0; F9.0; F10.0
Animal Science[1, 2]	10–12	Technology 4.5; Health and Safety 6.1; Ethics and Legal Responsibilities 8.4	ANR C13.0	ANR (Animal Science): D1.0; D2.0; D3.0; D4.0; D5.0; D6.0; D7.0; D8.0; D9.0; D10.0; D11.0; D12.0
Plant Science[1, 2]	10–12	Communications 2.2, Writing Strategies and Applications (11–12) 1.7; Leadership and Teamwork 9.3	ANR C13.0	ANR (Plant Science): G2.0; G3.0; G4.0; G5.0; G6.0; G7.0; G8.0; G9.0; G10.0; G11.0
Agricultural Government/ Economics[2]	12	Academics 1.3, Principles of Economics (12), all; Communications 2.2, Writing Strategies and Applications (9–10) 1.3; Technology 4.3; Technical Knowledge and Skills 10.3	ANR (Agricultural Business): A1.0; A2.0; A3.0; A4.0; A8.0; A9.0	History–Social Science, Principles of American Democracy Strand: substrands 12.1–12.9

[1]May be an ROCP course, which would consist of two periods.
[2]May be a 2+2 articulated Tech Prep course or a regular community college course.

Determining target standards for courses is not a simple process. Like most of the following steps, that determination should be included in the school's professional development plan, and substantial time and resources should be allotted for the task. When the standards-by-course delineation is finished, CTE instructors will have clearly defined the key standards that will guide curriculum, instruction, and assessment in their courses, allowing them to prepare students more consistently and rigorously for subsequent courses and training in their field. A review and adjustment of the standards by course will probably be required when new courses are added, and periodic reviews will allow for change in the industry.

Part II of this publication contains examples of the types of standards that might be included in a sample course for each pathway.

Curriculum Mapping

In the next step, curriculum mapping, CTE teachers first determine the sequence of the CTE foundation and pathway standards in their courses. This process results in a list of standards that represent the progression of learning throughout the course. This progression can then be organized in instructional units. Again, this step is best incorporated into the professional development program.

Because the CTE standards are generalized at a fairly high level, items on the list of standards may appear multiple times. For example, in the Vehicle Maintenance, Service, and Repair pathway, standard A2.5 ("Use measurement scales, devices, and systems, such as dial indicators and micrometers, to design, fabricate, diagnose, maintain, and repair vehicles and components following appropriate industry standards") might appear at several points in the curriculum map if the course is organized by vehicle components or types of vehicles. Similarly, the chosen foundation standards might be taught and assessed in more than one unit. For example, the following two foundation standards for the Vehicle Maintenance, Service, and Repair pathway might appear frequently in a curriculum map:

1. Problem Solving and Critical Thinking 5.3: Use critical thinking skills to make informed decisions and solve problems.
2. Academics 1.1 Mathematical Reasoning (grades eight through twelve) 2.1: Use estimation to verify the reasonableness of calculated results.

CTE teachers cannot teach and assess every standard in every unit even when the standards are relevant. And there may well be standards that are reinforced but not directly taught in a unit, particularly foundation standards. The key to assigning a reasonable number of standards in each unit is to determine how many standards will be assessed in the unit's performance task, project-based assessment, or formal test.

The curriculum development team should list only the standards that will be assessed for each unit in the curriculum map. Thus, teachers of courses in the Collision Repair and Refinishing pathway may teach the Communications standard 2.1 Reading Comprehension (grades nine and ten) 2.3 ("Verify and clarify facts presented in . . . a variety of consumer, workplace, and public documents") consistently throughout the course but assess it only twice in the unit test on a manufacturer's repair manual.

When the number of standards in each unit becomes manageable and the general progression of standards has been determined, the curriculum is mapped across the school year in weekly segments. For example, students in an introductory course in the Human Services pathway might well be expected to master all the Public Services standards in A1.0: "Students understand the history of human services in America and the role of and demand for human service professionals" and in A2.0: "Students understand the basic attitudes and skills needed to be a successful human service worker, including linking problem-solving methods to desired outcomes" in the first two months of the course so that they

can spend the balance of the year on the more advanced and performance-specific standards.

Curriculum mapping relies on the curriculum developers' sense of local resources, educational needs, and level of skills and knowledge students will need to succeed in the pathway's twenty-first century labor market. Teachers must determine which standards are the most important to teach and then devote the most time to instruction and assessment in those areas. Their decisions will then be reflected in the curriculum map. A simplified example of a curriculum map for Foundations of Child Development, an introductory course in the Child Development pathway of the Education, Child Development, and Family Services (ECDFS) sector, is shown by grading period (GP) as follows:

GP	Units	Pathway standards	Foundation standards
1	Child development careers	ECDFS A3.2: Students understand the educational and industry-related requirements for child care facilities staff.	Career Planning and Management 3.1: Students know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers.
	Safety	ECDFS A4.0: Students understand and apply critical safety, emergency, and disaster procedures at the work site.	Health and Safety 6.0: Students understand health and safety policies, procedures, regulations, and practices, including the use of equipment and handling of hazardous materials.
2	Physical development	ECDFS A5.0: Students understand important elements of a child's physical, intellectual, emotional, and social growth and development.	Technical Knowledge and Skills 10.3: Students understand the importance of studying child growth and development from infancy through adolescence.
	Nutrition and health	ECDFS A9.0: Students understand and apply the principles and practices of good nutrition, health, and safety for infants and children.	Health and Safety 6.0: Students understand health and safety policies, procedures, regulations, and practices, including the use of equipment and handling of hazardous materials.
3	Emotional development	ECDFS A5.0: Students understand important elements of a child's physical, intellectual, emotional, and social growth and development.	Technical Knowledge and Skills 10.10: Students understand the factors that affect the development of individuals and how to build positive relationships.
	Interactions; guidance	ECDFS A6.0: Students understand and apply the principles of positive interactions, guidance, and discipline in the workplace.	Technical Knowledge and Skills 10.4: Students understand positive guidance and discipline techniques that promote feelings of self-worth as they apply to the developmental stages of children.

GP	Units	Pathway standards	Foundation standards
4	Intellectual development	ECDFS A5.0: Students understand important elements of a child's physical, intellectual, emotional, and social growth and development.	Technology 4.0: Students know how to use contemporary and emerging technological resources in diverse and changing . . . environments.
	Effective learning environments	ECDFS A7.0: Students understand and apply the essential components of an effective learning environment for the early childhood classroom.	Technical Knowledge and Skills 10.5: Students understand the value and methods of providing infants, children, and adolescents with play and developmentally appropriate learning activities.

Contextual Learning

The Center for Occupational Research and Development describes contextual learning as follows:

> According to contextual learning theory, learning occurs only when students (learners) process new information or knowledge in such a way that it makes sense to them in their own frames of reference (their own inner worlds of memory, experience, and response). This approach to learning and teaching assumes that the mind naturally seeks meaning in context, that is, in relation to the person's current environment, and that it does so by searching for relationships that make sense and appear useful.[9]

Contextual learning can be viewed as a continuum of the following:

- Hypothetical situations
- Simulated conditions
- Projects within an authentic activity, with limited engagement
- Full participation in a real-world activity

The continuum is similar to that presented in Willard Daggett's model of rigor and relevance (see Chapter 5) moving from quadrant C to quadrant D. For CTE that continuum might be represented in the following experiential activities that build the foundation for full work-based learning.

Experiential Activities

The foundation for work-based learning is found in a variety of experiential activities, such as the participation of career technical student organizations, career-based service learning, and entrepreneurship:

Career technical student organizations (CTSOs). In CTE student organizations serve a unique role. In addition to offering access to the usual social and academic support from groups and activities, such as student government and service organizations, CTSOs provide activities specific to an industry sector or career pathway. They offer CTE students ways to bond with their schools and

develop the essential knowledge and skills of the CTE foundation standards while exploring their career interests. Specifically, these organizations promote leadership, teamwork, community service, and professional development.

The following organizations provide students with opportunities for networking and mentorship:

- Future Homemakers of America (FHA-HERO), promoting careers in consumer and family studies
- Distributive Education Clubs Of America (DECA), the association of marketing students
- SkillsUSA, the industrial and technical students' association
- Health Occupations Students of America (HOSA)
- Future Business Leaders of America (FBLA)
- Future Farmers of America (FFA)
- Technology Student Association (TSA)

Involvement in CTSOs helps build the skills and knowledge necessary to make the all-important transition from school to work. Competitions within and among these groups provide members with an external assessment of their skills and abilities. In CTSOs students are able to compare their results not only with those of their peers at a single high school but also with those of their fellow CTE students across the state and nation. And these associations can prove valuable resources for recommendations and career opportunities as graduates enter postsecondary education or the workforce.

Student organizations also offer opportunities for participants to develop leadership capacity and interpersonal skills that may not be as accessible to them outside CTE, especially in large high schools. Given the relatively close-knit nature of many CTE programs, the career-based student organizations foster leadership skills by providing training through serving as club officers, committee chairs and members, and members of special-event task forces. These opportunities significantly augment the leadership options available through other clubs and organizations in the school and help ensure that no student is marginalized.

Career-based service learning. Another experiential activity connected to CTE is service learning, which places students in real-life experiences and allows their service activities to drive the development of their academic and workplace skills. Thus, service learning can help fill the gap between school and work. *Note:* Some high schools have developed a CTE Career Service class as a capstone.

The key difference between work-based learning and service learning lies in the nature of the real-world component and the role of the student in these experiences. Service learning, which is unpaid, is conducted in the public or private nonprofit sectors. Although an unpaid internship and a service-learning project may seem similar at first glance, the service-learning experience is more likely to be focused on a project or a discrete assignment rather than on a job or work position. The service-learning experience may also include the involvement of the entire class and contact with a public agency or a private nonprofit agency that is primarily adult driven. Or, in the case of capstone projects, it may include

an activity negotiated by a student with an agency. On the other hand internships are more frequently negotiated between a student, a business representative, and the CTE teacher or internship adviser. The advantages of having work-based learning and service learning have been described as follows:

> These differences, however, can be used by practitioners to create "a menu of applied learning" from which young people may choose, thereby expanding their learning opportunities. Even if such strategies start small, the "synergy" between these two initiatives can really lead to much bigger things.[10]

Entrepreneurial activities. Increasingly, CTE students are choosing to operate their own businesses as personal enterprises outside the classroom or school. They may undertake their endeavors as follows:

- Under the guidance and with the support of the school or the CTSO
- In a structured option, such as the supervised agricultural experience program within a business environment
- In a group as part of a cooperative
- As individuals working alone or assisted by a mentor or parent

The degree of structure provided depends on whether school credit or other credit is being awarded for projects. Students may be encouraged to keep records of those activities, including business agreements, budgets, journal pages to record receipts and expenses, and accounting pages, such as depreciable property and inventories, that may be assessed for credit or partial credit.

Work-based Learning

Work-based learning is a broad term encompassing a variety of work experiences tied to schooling. The value of this learning approach is incalculable in that it is the way most adults learn best—by performing a task in a real-world setting. Work-based learning is usually reflected in a coherent sequence of program courses at the advanced or capstone level. School-generated work-based learning includes job shadowing, career-related mentoring, school-based enterprises, internships, cooperative vocational education, community classrooms, apprenticeships, work experience education, and WorkAbility, each of which is discussed as follows:

Job shadowing usually entails a student's observing a worker on the job. Although unpaid, this type of work-based learning experience has many rewards, including increasing a student's career awareness, setting an example of a positive work ethic, and reinforcing the link between classroom learning and work. Typically, a job-shadowing assignment ranges from a part of one day to several days but may be considerably longer for some intensive assignments. In fields where work experience is impractical (e.g., in heavy machine operation) or when students need increased support in making the transition between school and work, intensive job shadowing is sometimes offered.

Some schools set aside a day after *STAR* testing in the late spring for all students at a given grade level to participate in a day-long job shadowing. To prepare

for this event, staff and volunteers begin enlisting local businesses and securing opportunities in the fall. Students are then matched to opportunities that reflect their career interest. Before the day of the job shadowing, students spend several days in researching the field, developing appropriate questions, and mastering appropriate job-shadowing etiquette. On the appointed day they are sent out in groups to carry out their job-shadowing assignments. After they return, they write a reflection of their learning and a letter of thanks to their host business. Both of these activities address eleventh- and twelfth-grade English–language arts standards.

Junior Achievement, Inc., can assist in establishing job-shadowing programs for middle schools and high schools. It offers a curriculum for in-school teacher-led activities before and after job shadowing. The teacher emphasizes foundation skills, such as analyzing situations, applying information, asking questions, using critical thinking, following directions, using interpersonal skills, making observations, taking responsibility, and using workplace etiquette.

Career-related mentoring creates a relationship between a student and an adult based on the student's career interests. The adult mentor offers insight into his or her career, including appropriate academic and career-based knowledge and skills preparation, as well as support, guidance, motivation, and assistance to the student in exploring various careers within a pathway.

Mentoring programs require intensive and systematic screening, training, monitoring, and support. Schools may consider partnering with a community-based organization for career-related mentoring, such as the Boys' and Girls' Club or Big Brothers, Big Sisters. Another option is e-mentoring, in which an external organization provides career pathway mentors online for students, with appropriate monitoring of e-mail exchanges to ensure the students' safety. Some of these sites are operated by private, nonprofits agencies; others are industry based.

School-based enterprises are small businesses operated by students who, for example, build houses, publish books, run restaurants, operate a children's science museum, manage an on-site birthday business, run a student store, or provide countless other goods and services under school oversight. They are often directly related to a CTE or academic course, although sometimes the school offers a school-based enterprise course that provides support for a variety of entrepreneurial efforts. Among the many benefits of school-based enterprises are the following:

- Direct application of CTE foundation and pathway standards
- Practice of problem solving in real contexts
- Development of work-based teamwork skills

School-based enterprises also offer excellent opportunities to engage in all aspects of business, including managing costs, ordering materials, working under pressure, conserving supplies, planning and executing a marketing campaign, and maintaining facilities. For many students school-based enterprises provide their first work experience; for others, they provide an opportunity to build management, supervision, and leadership skills. Students may use enterprise profits to pay managers a small salary, offset school activity costs, or donate to a student-chosen cause.

School-based enterprises require significant support from faculty and staff. Fortunately, excellent resources are available to schools interested in establishing school-based enterprises. For example, DECA hosts a Web site (http://www.schoolbasedenterprises.org) that offers start-up instructions and operating manuals for all aspects of student store operations. Real Entrepreneurship through Action Learning (REAL) also offers professional development opportunities and materials online at http://www.cfed.org/focus.m?parentid=32&siteid=341&id=341.

Other options exist for simulated enterprises (e.g., Virtual Enterprise, a popular simulated business course). These enterprises are created and operated by students to prepare for work in a real business environment. With the guidance of a consultant (the teacher) and local business partners, students determine the products, services, and management structure of their businesses. They engage in daily business operations, using industry-standard software, communications, and the Internet for transactions. The simulation takes the teacher outside the traditional instructional paradigm and places the students on the front lines of the business world. Competitions within the state, region, and nation assist schools in continually improving their enterprises. In California the Kern High School District is home to the Virtual Enterprise Center, found online at http://www.virtualenterprise.org.

Other opportunities for school-based enterprises are available through Junior Achievement (JA) and the Ford Partnerships for Advanced Studies (Ford PAS). The JA Company Program analyzes and explores personal opportunities and responsibilities within a student-led enterprise. Volunteers provide between eight and 15 activities incorporating such skill-building areas as assembling products, estimating, creating needed forms, giving reports, graphing and interpreting data, negotiating and solving problems, assessing markets and marketing, selling, and promoting teamwork.[11]

Students also develop a business plan in one of five Ford PAS integrated semester courses, all of which provide real-world learning opportunities for students. Academically rigorous and interdisciplinary, the Ford PAS curriculum and program provide students with the knowledge of content and the skills necessary for success in such areas as economics, business, engineering, and technology. This inquiry- and project-based program links classroom learning, higher education, and workplace realities through exciting, motivating activities. Most of the curricula and resources are downloadable without charge at http://www.fordpas.org.

Internships are short-term, structured work-experience activities in the public or private sector that may or may not involve payment. They may be offered during the school year or over the summer, the latter having the advantage of avoiding conflict with school-year schedules. The length of internship in hours per week and weeks per year varies significantly according to the school's structure for the program.

Internships may:

- Satisfy course requirements.
- Earn stand-alone academic credit.
- Meet graduation requirements.

Internships motivate students to select the right courses, study harder, and make learning and success in high school a priority. Students benefit from seeing and participating in real-life applications of the academic, technical, intellectual, and personal skills taught in high school. Other advantages for students include learning to use modern workplace equipment, solving workplace problems, having firsthand experience with employer expectations, learning that high performance in high school counts in the workplace, and experiencing many aspects of an industry.

Internships also give students access to jobs that can lead to high wages and to careers with advancement possibilities rather than the low-skill, low-wage jobs usually available to high school students. For economically disadvantaged students internships provide opportunities that other students might obtain through family networking, thus helping to level the playing field for entry-level jobs in well-paid careers. Such students may also be eligible for paid internship services through One Stop Centers, funded through local Workforce Investment Boards, or through WorkAbility I programs for students with disabilities.

Teachers also benefit from internships by gaining a better understanding of what business and industry expect. By observing student interns, teachers can adjust their curricula and instruction to the needs of the work site. And internships allow employers to preview young workers and benefit from strong, long-term relationships with the local schools they rely on to produce qualified job candidates for their companies.

Some CTE teachers manage internships in their program through a concentration or capstone course. In schools that offer internships to all students (or require the completion of an internship to graduate), a staff or faculty internship coordinator has time allocated to manage the internship program, helping students narrow industry choices, master interview techniques, and learn to respond to employer expectations. The coordinator also works with employers to establish learning outcomes, pay status, hours, and duration and monitors the internship to ensure that both students and employers are satisfied. Often, the students receive credits from English teachers who read the student's letters thanking the internship sponsors or essays in which the students reflect on their internship experience.

Cooperative vocational education is an instructional methodology in which periods of CTE classroom study alternate with periods of related work experience. Usually, students attend classes during part of the day and work the other part or attend classes full time initially and then once a week after a cooperative placement has been made. The employer, the CTE teacher, the student, and the student's parents develop an individualized learning plan specifying the competencies or standards to be mastered, the expected duration of training for each competency or standard, the place (classroom or on the job) where the competency or standard is to be taught, and verification of student mastery of the competency or standard. The student, who must be at least sixteen years old, receives school credit for both work-related classroom instruction and the work experience, which typically amounts to at least eight hours a week. Usually, the

work experience component involves payment, and conditions are spelled out in a contract. The CTE teacher monitors the placement regularly.

In addition to gaining increased skills, students benefit from clarification of career goals; increased understanding of the relevance of academic and CTE learning and motivation for continued study; improved self-reliance, self-confidence, and responsibility; practice in human relations skills; contacts with potential employers; exposure to practicing role models; and, of course, direct income. Employers also benefit from effective screening, selection, and recruitment; higher employee retention and productivity; lower recruitment and training costs; and improved public relations. And schools benefit from improved relationships with business and the community, opportunities for faculty to keep current on workplace requirements, and enhanced student retention and graduation rates.

Community classrooms is a term that refers to instructional methodology using on-the-job training experiences at business, industry, and public agency sites to help students acquire the competencies (skills, knowledge, and attitudes) necessary for entry-level employment. This methodology extends CTE classroom instruction and helps students acquire saleable skills. Because students are not engaged in "productive work" as defined by law, the positions are unpaid and may not be used to displace regular paid workers. As with cooperative vocational education, each student has an individualized training plan. Benefits to students and employers are similar to those for cooperative vocational education.

Apprenticeships are offered to students eighteen and older through a formal agreement between an employer and an employee in which the apprentice learns a craft or trade through on-the-job training and related classroom instruction. Individual programs typically span a period of three to five years during which registered apprentices work on the job for 2,000 hours of reasonably continuous paid employment and attend approximately 144 hours of related and supplemental classroom instruction at ROCPs or adult schools.

Middle schools and high schools frequently include apprenticeship awareness in their regular career awareness programs. (See Chapter 5 for more information.) Furthermore, some industry sectors offer more formal preapprenticeship programs, such as the Automotive Youth Education System (AYES). Other high school preapprenticeship activities include participating in the various forms of work experience discussed previously in an apprenticeable field and learning about options for beginning careers.

Work experience education requires school-based related instruction for students, who may register for up to three periods of work experience during any semester. These paid or unpaid on-the-job experiences for secondary school students require school districts or other local educational agencies to have training agreements with employers and a plan approved by the California Department of Education to offer vocational, general, and/or exploratory work experience education. California law requires a student-to-teacher ratio of no more than 125:1, regular monitoring of workplaces, and documentation of workers' compensation coverage. The purpose of work experience is to allow students to learn and earn.

In California the types of work experience education offered are general, vocational, and exploratory:

- *General work experience education* helps students choose a career path, prepares them for full-time employment or continued part-time employment during college, and helps them develop skills, habits, and attitudes conducive to job success and personal growth.
- *Vocational work experience education* reinforces and extends career-learning opportunities for students through a combination of related classroom instruction and supervised paid employment. This is generally a capstone option for students completing a pathway sequence of courses.
- *Exploratory work experience education* helps students determine their career interests and aptitudes through opportunities to observe and sample a variety of conditions of work. The students may perform work without pay while exploring a career according to a limited, periodic, and sampling approach. The length of the exploratory assignment may vary. Students may participate in exploratory work-experience programs concurrently with paid part-time employment during hours not assigned to the exploratory assignment. *Note:* The local educational agency must provide workers' compensation insurance for participating students.

WorkAbility. Initiated in 1982, WorkAbility I has been cited as one of the best school-to-work transition programs in the nation for students with disabilities. Its success is frequently attributed to outstanding care in matching students with employers and providing two-year follow-up support services. This federally funded program provides comprehensive preemployment training, employment placement, and follow-up for high school students in special education making the transition from school to work, independent living, postsecondary education, or training. More than 300 WorkAbility I program sites successfully coordinate with state and local service providers to offer comprehensive services tailored to local economic needs. Over 10,000 employers statewide each year participate in WorkAbility I, finding the students to be well prepared for entry-level employment and reliable.[12]

The overwhelming advantages of work-based learning open a dialogue on how schools might offer these benefits to all students. Planning to provide intensive, high-quality work-based learning for all students challenges schools to engage the whole community of employers to creating an effective work-based learning infrastructure on a large scale. Providing such extensive work-based learning presents two challenges: (1) recruiting employers for participation; and (2) structuring effective work-based instruction. CTE programs can address the first challenge by using business leaders to recruit their peers and/or using intermediary organizations respected by the business community for recruitment. Involving employers early in the planning process will also maximize their commitment and ensure that the program meets their needs. Inviting employers to participate in related activities, such as sitting on evaluation panels for senior projects, judging student competitions, and conducting mock job or scholarship interviews can

engage business people in the school's CTE activities and help them understand what students are learning and how they are being evaluated. Teachers who build professional relationships with business leaders through their own participation in externships can also use those connections to recruit employers for work-based learning programs.

Collaborative planning, strategic design, and ongoing support are all required for successful work-based learning. Schools, employers, students, and any intermediaries should agree formally on the goals of work-based learning and the means to achieve them. The agreement should be documented in an individualized, written, standards-based learning plan. It may be modified during the experience provided all parties concur. The agreement should, as much as possible include exposure to several aspects of the industry because students reap greater benefits and develop broader, more transferable skills by performing a range of job duties rather than preparing for a single job.

Finally, all work-based learning should relate to a student's course work, and the two should be mutually reinforcing. For example, an internship in a hospital might logically be offered while a student is enrolled in a Health Technology course. This very close relationship is inherent in some delivery modes, such as academies, but must be consciously monitored in other settings.

Conclusion

In California CTE is delivered through a significant variety of venues, each serving a distinct target audience. In each setting CTE educators and business representatives must initially create or review the existing program by:

- Creating the course sequences in target industry sectors, considering available resources and community need
- Assigning foundation and pathway standards to each course in each sequence to ensure coherence and student mastery of key standards
- Developing a curriculum map for each course indicating what foundation and pathway standards will be taught and assessed in each grading period

At the concentration and capstone levels, CTE almost always includes work-based learning, which may begin with job shadowing, career-related mentoring, or school-based enterprises and progress to internships, cooperative vocational education, community classrooms, apprenticeships, or work experience education.

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Chapter 2

Lesson Planning and Instruction in Standards-based Education

Standards-based education requires that teachers begin with the end in mind. This concept of backward planning ranges from understanding the standards and delivering instruction to analyzing assessment results and determining what further instruction or individual help is needed. The California Department of Education's publication on standards-based education in high schools, *Aiming High,* provides detailed guidelines for carrying out the following steps in standards-based education:

1. Select and analyze [also termed "unpack" or "unwrap"] the standard(s) to be met.
2. Design or select an assessment through which students can demonstrate mastery of standards; determine the required performance level, if not given.
3. Identify what students must know and be able to do to perform well on the assessment.
4. Plan and deliver lessons. Provide *all* students with adequate opportunities to learn and practice the necessary skills or knowledge.
5. Assess students and examine results to plan further instruction or individual support, if needed, and grade their work.[1]

Chapter 1 of this framework focuses on the activities required in career technical education (CTE) before the first of the five steps just listed can be taken:

- Creating CTE programs with career course sequences
- Assigning appropriate standards to each course in the sequence
- Mapping the curriculum across the year and developing pacing guides
- Ensuring inclusion of work-based learning

This process is more complex for career technical education courses than for academic courses because CTE initially requires that teachers determine which standards should be taught in each course by pathway. Teachers then complete the curriculum mapping for the course, determining the placement of each standard in a unit and the timing of units and standards in a school year. At this point teachers are ready to move on to steps 1 through 5 after they have gained a thorough understanding of assessment in a standards-based system.

Before moving into lesson planning, teachers should review the foundation concepts and latest research about assessment because assessment is what drives the instruction cycle in standards-based education.

Purpose of Assessment in a Standards-based Environment

Assessment of student learning, essential in standards-based CTE instruction, is the venue students use to demonstrate their mastery of the subject standards and the means CTE teachers use to gather data about the effectiveness of their instruction. In general it is an area of strength for CTE because it benefits from the many techniques and criteria used historically for assessing mastery. Further, assessment is one area in which the demonstration and application of knowledge and skills, the core strengths of CTE, are used to the fullest through performance tasks and projects.

In a standards-based environment assessment must be aligned with the content standards and the curriculum. Given that a rigorous, standards-based curriculum is the prime generator of increased student achievement, aligning hands-on instruction and assessment with a rigorous curriculum is the key to improving student learning.

In CTE learning goes far beyond success on a standardized test. Its end product is the knowledge and skills that translate to success in work and lifelong education. As a result CTE instruction is a perfect environment for strong, rigorous learning combined with authentic, standards-based assessment that accomplishes the following:

1. Evaluates student progress and mastery level in relation to the foundation and pathway standards addressed in a CTE course
2. Gives teachers direct feedback on the effectiveness of instruction and the curriculum
3. Allows teachers to plan for further instruction or individual support, thus generating data-driven instruction
4. Assists in the creation of future curricula by providing information over time about how well a substantial number of students have mastered the standards.

Types of Assessment and Scoring Tools

For an assessment to be useful, it must distinguish between positive and negative—or desired and less desired—outcomes and must result in a rating or evaluation score, generally on a scale of advanced to unacceptable or below basic. The types of assessments that students typically encounter in California are the following:

1. *Criterion- or standards-referenced tests and tasks.* In these assessments a student's knowledge is compared with the defined mastery of the subject/standards rather than with the scores of other students. Industry-developed certification examinations are excellent examples of this type of assessment. No scoring curve or comparison is used. Students either pass or fail on the basis of a predetermined cutoff point.

2. *Content standards assessments.* These assessments consist of "broadly stated expectations of what students should know and be able to do in a particular subject and/or grade level."[2] CTE foundation and pathway standards are content standards assessed through appropriate tests or projects with rubrics.
3. *Benchmarks.* These more specific versions of content standards detail descriptions of performance targets for specific career stages, goals, or grades. Because California does not provide benchmarks for academic or CTE standards, they must be developed by teachers, working cooperatively at the district or school-site level.
4. *Norm-referenced tests.* In this type of testing, students are compared with other students. The most-proficient students receive the highest scores, and the less-proficient students—even if they have acquired all the relevant skills and knowledge—receive lower scores. This testing, which reflects the old-fashioned grading-on-the-curve approach, fails to convey the career-related standards of performance focused on by CTE.
5. *Comparative or pretests and posttests.* The basis for comparison in this testing is the student's prior performance. That is, the student is tested prior to beginning a learning task or unit and after completing the work. This type of testing is most useful when CTE instructors wish to measure the student's progress; that is, to learn what effect instruction has had on a student's overall knowledge and skill.

Objective Assessment. An assessment is objective when "the scoring procedure is completely specified" and results in total agreement between different scorers.[3] On an objective test there are correct and incorrect answers. Examples of objective assessment include the following:

1. *Traditional multiple-choice, true-false, matching, and similar types of test items in written examinations.* This type of testing is most appropriate in CTE instruction when a body of knowledge must be acquired and applied (for example, in the study of accident prevention and treatment procedures in Food Service and Hospitality standard A2.3).
2. *Oral examinations.* The student is presented with questions and answers them aloud in a real-time scenario. This type of testing is useful when the knowledge or skill must be readily available and smoothly applied (for example, for emergency procedures in health occupations).
3. *Credentialing or licensing exams.* These exams can be norm-, criterion-, or standards-based and may include traditional written, oral, and performance task assessments.
4. *Certain performance tasks.* These can be tasks that reflect a right-wrong response:
    a. A ledger is balanced or not balanced according to given criteria.
    b. A nonfunctioning small engine can or cannot be made to run.
    c. A soufflé can rise properly or fall.

Performance tasks can also exhibit a range of quality, such as an air engine that works only at a high rate of pounds per square inch (PSI) of air pressure compared with another engine that works more efficiently by operating at a lower PSI. Each of these tasks involves a variety of steps and considerations. Thus, the objective aspect of the assessment is generally divided into several parts (that may or may not be objective in and of themselves) so that students can learn from—and be assessed on—those steps that they perform correctly and those with which they experience some difficulty.

Subjective Assessment. An assessment is considered subjective when the opinions of the evaluators determine the scores and the scores differ from one another. In this kind of assessment, a rubric (a detailed scoring guide) should be used to provide examples of performances or a scale of results to increase the reliability of the raters and the consistency of the results.

Exemplars are examples of work that scored as advanced or proficient on the rubric. Exemplars further increase the students' understanding of expectations and the reliability of the scoring by several different evaluators. Generally, in subjective assessments there are no prescribed correct answers. Such assessments can be found in the following:

1. *Juried exhibits, reviews, and performances.* The assessment is performed by a panel of experts in the field, including the CTE teacher. Included may be gallery showings or screenings (in Media and Design Arts), runway shows (in Fashion and Design), and livestock, horticulture, or agricultural science exhibitions at fairs (in the relevant Agriculture and Natural Resources pathways).
2. *Observations of field work or internship.* Usually, a trainee or apprentice in the field is supervised directly by an individual at the work site and by the school's work-based supervisor. The school representative assesses the student's work, using a combination of the student's self-reports and the supervisor's evaluations, interviews and meetings with the student, and observations at the job site. This type of assessment is appropriate in most CTE work-based learning assignments.
3. *Performance-based assessment.* In this type of assessment, the teacher constructs a performance task or project that allows students to demonstrate mastery of the target standards. The teacher creates a rubric that spells out the benchmark at each level of mastery for each standard. Then the students are provided with exemplars showing them exactly what proficient products from the performance task look like.
4. *Review of portfolio or journal.* Students maintain a portfolio of work or a journal chronicling their activities. The teacher reviews the materials and assesses the quantity and quality of work according to a published rubric. Frequently. portfolios are used in sectors focused on visuals, such as the arts, graphic design, fashion design, and landscape design. However, they may be used in all pathways because they make the students responsible for organizing the work, allowing the teacher to take the role of coach. This assessment model clearly demonstrates growth of knowledge and skills over time.

5. *Review of final project or other outcome product.* Students apply their knowledge directly to a field-based project that may be completed in stages, with a rubric for each stage, allowing the teacher to provide formative feedback as the project progresses. The assessor evaluates the students' mastery of the standards, as demonstrated by the quality of the project or other outcome product. This approach is appropriate in most CTE fields and is often used in high schools for senior projects.

Self- and Peer Assessment. CTE programs often incorporate a significant amount of self- and peer assessment; that is, assessment in which the student takes an active role. Students can easily self-assess their products at preliminary and final stages, using rubrics and exemplars to make accurate judgments. Teachers often require each product submitted to be accompanied by a student self-assessment. Students circle the appropriate levels on the rubric, make notes about similarities and differences between the product and the rubric descriptions, and estimate the amount of time invested and effort expended. If done for a preliminary submission, the teacher can respond, noting points of agreement and disagreement with the student's self-assessment. Then the student can address the comments to produce a higher-quality product and earn a better grade. This process can be repeated several times, with the quality of the product improving each time.

As students become familiar with this process, they can help create the rubric for the assessment. Teachers might begin by developing a rubric that has the ratings filled in for all but one of the standards, that one being chosen because students had already received considerable instruction in the skill. In small groups students can create the descriptive ratings for the chosen standard and compare their descriptions to gain the consensus of the class. Generally, students write more-demanding rubrics than teachers do. And as the students gain skill in this area, they can assume responsibility for a greater percentage of the rubric that represents known or partially known material.

When the product is a presentation (e.g., a sales presentation in the Professional Sales and Marketing pathway), students may be filmed during rehearsal. They should view their performance to analyze the quality on the basis of the rubric and a video exemplar. Students will then have clear guidance on specific ways to improve their performance.

Ultimately, self-assessment internalizes the assessment process so that the student moves away from merely getting the assignment done to completing performance tasks at the highest level.

Authentic and Project-based Assessments. Authentic and project-based assessments are used extensively in CTE. Authentic or real-world assessment allows students to measure their skills against the benchmarks used in business and industry and perform tasks in the industry settings or in simulations of industry environments. Students are assessed on their performance according to the same criteria regular workers are subject to. Project-based assessment simulates authentic assessment but takes place in a classroom or laboratory. Here students perform the same or similar tasks as do workers in industry but in a learning environment.

Industry-based Assessment. Experts within specific fields or industries develop authentic assessments as benchmarks for full-scale entry into the profession, including the following:

1. *Apprenticeship.* Some industries and unions offer programs combining the successful completion of related and supplementary instruction (RSI) with on-the-job training. Student competency is assessed through observation and interaction. Occupations that offer apprenticeship include firefighting, iron-working, licensed vocational nursing, carpentry, child care, electrical work, painting, tile setting, and plumbing.
2. *Industry certification examinations.* Many industries offer examinations designed to help employers identify competent individuals for certain occupations. Examples of such examinations are the following:
    a. A+ certification examination for entry-level computer technicians, offered privately or provided through professional organizations
    b. Marketing A*S*K certification examination, an independent examination designed to test mastery of specific business-related skills, offered by independent professional organizations
    c. Electrical certification examination, offered through state-certified organizations

Most examples in the following section and in Part II reflect variations of authentic and project-based assessments. For example, students learn how to make a specific type of plumbing connection in the laboratory and are then assessed as to their ability to make the connection correctly in a sink-drain assembly.

Development of Standards-based Lessons and Units for Classroom Instruction

With a good understanding of assessment and the curriculum map in hand, instructors are ready to develop units and lessons to deliver the standards. As previously mentioned, this process involves several steps, sometimes referred to as *backward mapping:*[4]

1. Analyzing, "unwrapping," or "unpacking" the standards
2. Designing the assessment
3. Identifying the skills and knowledge required for the assessment
4. Planning and delivering the lessons in the unit
5. Examining student work on the assessment
6. Using the data from the assessment to drive subsequent instruction

These steps are presented in detail in *Aiming High* and are summarized in reference to CTE standards as follows:[5]

Step 1: Analyzing, "unwrapping," or "unpacking" the standards. In a perfect world CTE foundation and pathway standards would be so transparent that educators, students, and parents would agree exactly on what information and skills

should be included in each statement and at what level that knowledge and skill should be mastered. In practice it becomes the task of the school district, ROCP, or program sponsor to make that determination. Therefore, CTE teachers, as content experts, must analyze the standards collectively and determine the scope and depth of the information and skills being addressed.

For example, Public Services standard A6.4 calls for students to "understand how and why accountability mechanisms protect people receiving human services." To ensure that students master this standard, teachers in the Human Services pathway first need to determine what knowledge and skills are needed. In this case teachers determined that students must *know* the following information at the level indicated in parentheses:

- The definition of accountability mechanisms (to the extent that they can provide a basic description and at least two examples)
- The reasons citizens might need protection when participating in human services programs (to the extent that they can provide two examples from history)
- The way in which accountability mechanisms protect people participating in human services programs (to the extent that they can relate the two examples of accountability mechanisms cited previously to real protections for participants)

The teachers also determined that students should be able to apply that skill by demonstrating their ability to determine the type of accountability measures that should be in place to address the three most prevalent problems experienced by human services participants.

The teachers then determined which accountability measurements or mechanisms should be included according to the level of the course. For example, in a concentration-level course, students might be expected to understand the following types of accountability measures:

- Cost per participant (such as in job-training programs)
- Length of time in processing claims or requests (as in some health and social services programs)
- Oversight of human subjects in testing (as in most health, education, and social service research)
- Maximum caseload sizes (as in drug and alcohol rehabilitation programs and the like)

Then the teachers determined what most students would need to be taught to demonstrate mastery of the standard. On this list they placed all three knowledge items, together with a description of how to determine what problems a participant is encountering and how to relate those problems to potential accountability measures:

The whole process may be captured in a chart like the one used in all pathways in Part II. The following sample chart is filled in for a standard at the capstone-course level in the Public Utilities pathway of the Energy and Utilities industry sector.

Analyzing, "Unwrapping," or "Unpacking" a Standard Sample

Standard	**Energy and Utilities C6.0** Students understand management procedures and processes as they occur in a public utilities industry project.	
Standard subcomponent	**Energy and Utilities C6.2** Use scheduling systems to plan sequences of events in public utilities industry projects.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. The nature and purpose of scheduling systems 2. Typical events or activities that must occur to complete a public utilities industry project 3. The order in which typical events or activities must occur	*Benchmarks* 1. Give a basic description of at least one scheduling system and its purpose. 2. Cite at least ten events or activities that must be completed in a simple project. 3. Order the ten events or activities cited in a typical and logical manner.
What should students be able to do? At what level?	*Skills* 1. Use a simple scheduling system. 2. Identify the events or activities and steps inherent in them for a simple project. 3. Use the simple scheduling system to schedule the steps to complete a project on time.	*Benchmarks* 1. Use the system to schedule tasks, having been given textbook examples, with 90 percent accuracy. 2. Identify necessary steps with 80 percent accuracy. 3. Combine the processes in an open-ended, real-world example with 75 percent accuracy.
Topics and contexts What must be taught?	1. Basic knowledge of preceding concepts 1–3 2 How to use two different, elementary scheduling systems 3. How to determine the steps necessary to complete a project 4. How to use a scheduling system to create a project timeline	

Although this analysis is effective for many standards, it may be less effective for others. In each case the teacher writes in the target standard, subcomponent, and course level. Indicating the course level is essential because many standards are taught at every level but have increasingly higher expectations written into the knowledge and skills benchmarks at each level. Teachers must delineate what knowledge is essential to mastering the standard at a given level and what level of understanding the student must have, thereby answering the question, What do students need to know and at what depth of knowledge? Then the teacher responds to the same questions for skills. The last section summarizes what must be taught for students to master the standard or subcomponent chosen. Creating these parameters is essential to the rest of the process and helps instructors clarify for themselves exactly what they will teach and assess.

Step 2: Designing the assessment. Assessment in a standards-based environment is different from traditional assessment. Because one of the major strengths of CTE is the applied, authentic, hands-on nature of the learning, performance tasks or project-based assessments should be included to determine the extent to which the student has mastered the chosen standards in each unit. They may be used in addition to or in lieu of the more traditional pencil-and-paper tests.

Planning performance tasks or project-based assessments is easier in a standards-based environment than in a traditional curriculum because the end is clear. That is, the assessment must show at what level the individual student has mastered the CTE foundation and pathway standards chosen for the unit.

When planning standards-based assessments, teachers select and analyze the CTE content standards targeted during the analysis of the standards. For example, with Marketing, Sales and Service standard B4.4 ("Understand how market research is used to develop strategies for marketing products or services in a small business"), the students might conduct market research, make decisions based on that research, and then design an appropriate marketing tool. Several academic foundation standards matching this instructional approach are the following:

1. Communications 2.2, Writing Strategies and Applications (grades eleven and twelve) 1.3: Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.
2. Communications 2.2, Writing Strategies and Applications (grades eleven and twelve) 1.6: Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).
3. Academics 1.2, Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.

This performance task would also be an opportunity to assess a foundation standard in another area, such as Leadership and Teamwork 9.3 ("Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals").

Working with the selected standards, teachers develop the students' assignment for the assessment. The assignment and the assessment rubric must be given to the students in writing and may also be sent home for parental review and signature.

Sample student performance tasks. In this section two performance task samples are provided. Each sample has two parts, the student assignment and the rubric to assess the assignment. Both parts are given to students at the beginning of the unit or lesson sequence.

Sample 1. Entrepreneurship: Student Assignment

Overview. In this unit we will be studying how manufacturers conduct market research to ensure that their products will be competitive and to help shape their advertising campaigns. The study will include Chapter 9 of the text, two videos, daily minilectures, and three readings for homework. For all these items you will

turn in notes in your portfolio. There will be two assessments: (1) a unit test on the information provided; and (2) the performance task outlined as follows:

Standards addressed. This performance task will require your demonstration of mastery of the following standards:

Standard number	Standard
Foundation: Communications 2.2, Writing Strategies and Applications (grades 11–12) 1.3	Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.
Foundation: Communications 2.3, Written and Oral English Language Conventions (grades 11–12) 1.2	Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
Foundation: Academics 1.2, Investigation and Experimentation (grades 9–12) 1.a	Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
Pathway: MSS B4.4	Understand how market research is used to develop strategies for marketing products or services in a small business.

Performance task. In your cooperative learning group, select a type of product for your market research—something you think other people will have definite opinions about, like pizza, sports drinks, running shoes, and so forth. Your job is to:

1. Design a market survey to determine what qualities consumers want in a chosen product. Use the information to be found in your textbook, in the readings, and in the minilectures. The survey must consist of at least eight questions, none of which are repeated.
2. Conduct the market survey, getting responses from at least 50 people.
3. Analyze the results, using a spreadsheet or database program, by (a) listing your findings; (b) determining clear trends in preference; and (c) making decisions about preferences from data that are not clear. Should you use those data or not? Why? Each person will make a different display of the data (e.g., pie chart, graph).
4. Create and present a 30-second radio advertisement for a fictional product that reflects your findings from your market research. Use at least two strategies for product promotion that you learned about in your readings.
5. Write a short report (at least 750 words) in which you explain the following:
    a. How you developed your market survey
    b. How you conducted the market survey and what your results were
    c. How you analyzed your results

d. How you came to the conclusions based on your data
e. How you used the market research in your advertisement
f. To what extent you feel your market research followed the guidelines presented in your textbook, in the readings, and in the minilectures

Each person in the group must write his or her own report and attach the group's radio script and market survey along with each member's data display.

Grading. Your unit grade will consist of 15 points on the test, five points on your portfolio notes, and 80 points on the performance task. On the large bulletin board at the back of the class, you will see examples of proficient or advanced work for each part of the performance task, examples of proficient portfolio notes, and a list of the items that will be covered in the test. As in business, to a significant degree, you choose your level of success (your grade) by the amount of time and attention you give to the task (the learning and demonstration of your knowledge and skill).

Performance task rubric. The standards will be assessed in the performance task. The rubric for each standard follows. The total number of points possible in the rubric is 80. *Proficient* is considered A-level work, meeting the expectations of the course. However, you will want *advanced* as your goal in every standard because in business only those who strive for excellence reap the top financial and personal rewards. The rubric shows you exactly how to earn that level.

Standard	Advanced	Proficient	Basic	Unacceptable
MSS B4.4: Understand how market research is used to develop strategies for marketing products or services in a small business. (50 points)	Market survey has nine+ questions and 60+ responses; data are correctly and thoroughly analyzed; accurate data analysis is used creatively in commercial; report shows insight into the process. (50 points)	Market survey has eight questions and 50 responses; data are correctly analyzed; data analysis is used accurately in commercial; report accurately reflects the process. (45 points)	Market survey has four to seven questions and 30–49 responses; data are correctly analyzed; data analysis is used in commercial; report accurately reflects the process in most parts. (40 points)	Market survey has fewer than four questions, or questions are duplicative; there are fewer than 30 responses; data are correctly analyzed in part but not used effectively in commercial; report does not reflect the process. (35 points)

Standard	Advanced	Proficient	Basic	Unacceptable
Communications 2.3, Written and Oral Language Conventions (grades 11–12) 1.2: Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization. (10 points)	All market survey questions are well phrased, nonduplicative, thorough, and comprehensive. (10 points)	All market survey questions are adequately phrased, nonduplicative, and fairly comprehensive. (9 points)	Most market survey questions are adequately phrased, nonduplicative, and fairly comprehensive. (8 points)	The majority of market survey questions are not adequately phrased, nonduplicative, or fairly comprehensive. (6 points)
Communications 2.2, Writing Strategies and Applications (grades 11–12) 1.3: Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples. (10 points)	Report includes all requirements and detailed, relevant examples; writing is at a typical business level of sophistication. (10 points)	Report includes all required elements with relevant examples; writing reflects high school sophistication. (9 points)	Report includes all required elements, most with examples; writing is not at a high school level of sophistication. (8 points)	Report does not include all required elements. (6 points)
Academics 1.2, Investigation and Experimentation (grades 9–12) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data. (5 points)	Spreadsheet or database is accurately used; data display is creative, clear, and user friendly. (5 points)	Spreadsheet or database is accurately used; data display is clear and user friendly. (4 points)	Spreadsheet or database is accurately used; data display is not clear. (3 points)	Spreadsheet or database is not accurately used; data display is not clear. (1 point)
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals. (5 points)	Teacher observes student taking leadership in effectively organizing group work and individual work. (5 points)	Teacher observes student helping to organize group work and structuring individual work effectively. (4 points)	Teacher observes student following the group work plan and adequately structuring individual work. (3 points)	Teacher observes student not following the group work plan or structuring individual work. (1 point)

Sample 2. Cabinetmaking and Wood Products: Student Assignment

Overview. In this unit we will learn key safety measures, cabinetmaking techniques, and equipment maintenance through the creation of our first product, a CD storage rack. The unit will cover the *Shop Safety Book,* pages 22–48; the video of safety techniques for using the table saw; daily minilectures or demonstrations; and three homework readings—one on the maintenance of each power tool. For all these items you will turn in the notes in your portfolio. In addition to creating the CD storage rack, you will prepare and submit your job plan; take two unit tests, one on safety information and the other on reading and interpreting the cabinetmaking fabrication plan; and complete your first draft of a safety and maintenance manual for the following power tools: table saw, router table, and orbital sander.

Standards addressed. This performance task will require your demonstration of mastery of the following standards:

Standard number	Standard
BTC A3.1	Use portable power tools safely, such as single and compound miter saws, drills, sanders, saber saws, and routers, safety and appropriately.
BTC A4.1	Understand the proper and safe use of stationary power tools used in the milling process, such as shapers, sanders, joiners, table saws, and band saws.
BTC A5.1	Know how to read, understand, design, and construct cabinets accurately from cabinetmaking fabrication and installation plans and specifications.
BTC A.5.3	Understand how to create a job schedule in a cabinetmaking project.
BTC A7.3	Use stationary and portable power tools in milling the components for cabinets and wood products.
BTC A7.4	Use stationary and portable power tools in the assembly of cabinet and wood product components.
BTC A7.5	Use finish tools (e.g. airless sprayers, palm sanders) and techniques for finishing cabinets and wood products.
Foundation: Communications 2.2, Writing Strategies and Applications (grades nine and ten) 1.3	Use clear research questions and suitable research methods (e.g., library, electronic media, personal interviews) to elicit and present evidence from primary and secondary sources.
Foundation: Communications 2.3, Written and Oral English Language Conventions (grades nine and ten) 1.4	Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
Foundation: Technology 4.2	Understand the use of technological resources to access, manipulate, and produce information, products, and services.

Assignment. You will build a CD storage rack according to a plan that includes scale drawings, details of joints, and fabrication procedures. You will also begin your own safety and maintenance manual that you will add to throughout the course. Your job is to:

1. Comply with all the safety features and maintenance requirements for the tools you will use: table saw, router table, and orbital sander.
2. Demonstrate how to read and understand fabrication plans and use those plans accurately to create your CD storage rack.
3. Create your own job schedule.
4. Mill the components for the CD storage rack, using the tools cited previously.
5. Assemble the components for the CD storage rack, using rabbet and tongue-and-groove joints.
6. Finish the CD storage rack according to the directions.
7. Create electronic and hard-copy versions of the draft of the first three chapters of your own safety and maintenance manual. Each chapter will focus on a different power tool: table saw, router table, and orbital sander. Each chapter will include the following:
    a. A brief (two- to three-sentence) description of the tool, together with examples of its uses in bullet form
    b. A list of the safety rules and procedures to follow when using the tool
    c. A list of procedures to follow in case of an accident
    d. A description of the proper cleanup of the tool and the area
    e. A list of procedures for routine tool maintenance

Grading. Your unit grade will consist of ten points for each of the two tests, five points for portfolio notes, and 75 points for the performance task.

In the front of the shop, there will be two CD storage racks—one at the proficient level and one at the basic level. I will review the rubric with you and then ask you to determine which example is proficient, which is basic, and why you made your decision. Then we will compare notes and label each model so that we can see the skill level reflected for each part of the rubric.

Examples of proficient portfolio notes, proficient personal safety and maintenance manuals, and proficient job schedules are posted on the bulletin board. Also posted is a list of the items that will be covered on each test.

Performance task rubric. The following standards will be assessed in the performance task. The rubric for each standard is shown in the following chart, and the total number of points possible is 75. *Proficient* is considered A-level work, meeting the expectations of the course. However, you will want *advanced* as your goal in every standard because cabinetmaking is a highly competitive and exacting craft requiring precision and discipline. The rubric shows you exactly how to earn that level.

Analyzing the samples. Several items should be noted in the previous samples. First, the units specifically integrate foundation academic standards, which are

taught and assessed only in relation to the CTE content. *Note:* The assessment of those standards is integral to the assessment of the CTE pathway standard.

Second, CTE teachers assess writing standards on the basis of the following:

- Full response to the requirements (both samples)
- Correct use of conventions (cabinetmaking sample)
- Use of details and examples (both samples)
- A general judgment about whether the writing exhibits sophistication appropriate to an adolescent writer (entrepreneurship sample)

In the cabinetmaking sample CTE teachers arranged with English teachers to complete the rubric that addresses writing and conventions. In this way students can receive grades and credit in both classes. Although the entrepreneurship teachers do not focus on English-language writing conventions, they do examine the level of sophistication of the writing in determining the students' grades.

Third, concrete examples of high-quality work for each element in the performance task, together with a list of items on the tests, are provided to the students. Research demonstrates that providing students with exemplars of the work they are asked to produce dramatically increases the quality of their products and performance.[6, 7] When teachers first use this assessment, they may create the exemplars. After that they should use exemplars from the highest-scoring work produced by students in previous years.

Standard	Advanced	Proficient	Basic	Unacceptable
BTC A3.1: Use portable power tools safely and appropriately. *and* **BTC A4.1:** Understand the proper and safe use of stationary power tools used in the milling process. (5 points)	Student uses and helps others use power saw, table router, and orbital sander safely and appropriately. (Must be observed by teacher.) (5 points)	Student uses power saw, table router, and orbital sander safely and appropriately. (Must be observed by teacher.) (4 points)	Student uses power saw, table router, and orbital sander safely but not always appropriately. (Must be observed by teacher.) (2 points)	Student does not use power saw, table router, and orbital sander safely. (Must be observed by teacher.) (0 points)
BTC 5.3: Understand how to create a job schedule in a cabinetmaking project. (5 points)	Job schedule reflects detailed planning. (5 points)	Job schedule reflects adequate planning. (4 points)	Job schedule is missing one step in the plan. (3 points)	Job schedule is missing more than one step in the plan. (1 point)
BTC A7.3: Use stationary and portable power tools in milling the components for cabinets and wood products. (20 points)	Milling is perfect. (20 points)	Milling has fewer than two minor errors. (18 points)	Milling has three to four minor errors. (16 points)	Milling has more than one major error or five or more minor errors. (8 points)

Standard	Advanced	Proficient	Basic	Unacceptable
BTC A7.4: Use stationary and portable power tools in the assembly of cabinet and wood product components. (20 points)	Assembly is perfect. (20 points)	Assembly has fewer than two minor errors. (18 points)	Assembly has three to four minor errors. (16 points)	Assembly has more than one major error or five or more minor errors. (8 points)
BTC A7.5: Use finish tools (e.g., airless sprayers, palm sanders) and techniques for finishing cabinets and wood products. (15 points)	Finish is perfect. (15 points)	Finish has fewer than two minor errors. (13 points)	Finish has three to four minor errors. (11 points)	Finish has more than one major error or five or more minor errors. (9 points)
Communications 2.2, Writing Strategies and Applications (grades 9–10) 1.3: Use clear research questions and suitable research methods to elicit and present evidence from primary and secondary sources. *and* **Communications 2.3, Written and Oral English Language Conventions (grades 9–10) 1.4:** Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization. (5 points; graded by English teacher)	Safety and maintenance manual includes all requirements, is detailed, and has no more than three errors. (5 points)	Safety and maintenance manual includes all requirements and has no more than five errors. (4 points)	Safety and maintenance manual includes all requirements and has no more than ten errors. (3 points)	Safety and maintenance manual does not include all requirements. (1 point)
Technology 4.2: Understand the use of technological resources to access, manipulate, and produce information, products, and services. (5 points)	Manual reflects detailed and accurate use of word processing and the Internet. (5 points)	Manual reflects accurate use of word processing and the Internet. (4 points)	Manual reflects one to two errors in use of word processing and the Internet. (3 points)	Manual does not reflect accurate use of word processing and the Internet. (1 point)

Providing students with a list of items to be tested is not the same as giving them the test questions or answers. Instead, the teacher is directing the students' attention, once again, to those standards and standard elements most important for mastery. In the first sample the teachers might, for example, post a list like the following:

Items on the Test Concerning Market Research:

1. Why manufacturers conduct market surveys
2. Six key elements of a market survey
3. Major mistakes you can make in marketing surveys
4. Four effective strategies for commercials
5. Ways to display data in a report

That information helps guide students in the process of learning, pointing them toward important information for notetaking and study as they read the text and assigned articles for homework, view visual aids, and listen to lectures. They will still have to demonstrate that they have mastered the information in the standards.

One last consideration about pencil-and-paper testing in a standards-based CTE environment is that the test should be written to relate to distinct parts of the standards. Different tests might be used for different types of standards, as in the cabinetmaking sample, where there are two tests, one for safety and one for plan reading. In the entrepreneurship sample test items might be related to the standards by having 15 questions on the test: three on examining why businesses conduct market research, four on creating and conducting viable market research, three on analyzing and displaying market research data, two on using findings to inform the marketing plan, and three on advertising strategies to promote customer purchases. When the test reflects the key parts of the standards, analysis of the test scores provides useful data on the extent to which the students have mastered each component of each standard.

Most CTE teachers have always required a test and a performance task for each major unit of learning. The primary difference here is that the sample performance tasks are built on CTE foundation and pathway standards, thus making obvious the important connection between foundation learning (including academic standards) and CTE pathway learning to reflect reality. Success in a small business depends on more than the technical skills of business (e.g., framing and conducting a market survey). It depends also on collecting data, translating data into an action plan, and using a variety of communication skills to implement that plan.

Significant evidence from research shows that schools can successfully intensify the rigor of the foundation standards in CTE course work without sacrificing the content of the CTE pathway standards. Both the MDRC, a nonprofit, nonpartisan social policy research organization, and the Southern Regional Education Board have performed longitudinal studies that show that integrating CTE standards with academic standards—such as those in the foundation standards—and requiring the completion of higher-level academic course work have substantially

increased the success of CTE completers, students who have completed an entire CTE sequence of courses, including introductory, concentration, and capstone courses.[8]

Step 3: Identifying the skills and knowledge required for the assessment. In this relatively easy activity, teacher lists the skills and knowledge required for a student to do well on the assessment and describe the method of instruction used to impart those elements. For example, with the assessment delineated in the previous entrepreneurship sample, the list might look like the following:

Skill and knowledge required	Method of instruction
Why market research is conducted	Textbook reading assignment; minilecture
How to create a market survey	Textbook reading; article reading; minilecture; exemplar
How to conduct a market survey	Textbook reading; article reading; minilecture
How to analyze data from a market survey	Minilecture; demonstration in computer lab
How to display data from a market survey	Minilecture; demonstration in computer lab
Strategies for advertising	Article reading; video; minilecture; exemplar
How to write the report	Assignment; minilecture; exemplar; draft report; feedback
How and what to study for the test	List on bulletin board; minilecture; study groups in class
How to take and use notes	Minilecture; exemplar; study groups in class
How to organize work in a group and as an individual	Minilecture to review previously taught skills, pointing out successful group techniques

Step 4: Planning and delivering the lessons in the unit. In this step teachers use the information in the preceding chart to plan and deliver the lessons for the period defined in the curriculum map. This process is basically the same in standards-based and traditional instruction and is enhanced by inclusion of the instructional strategies discussed in Chapter 1.

Step 5: Examining student work. This process, critical to student learning, consists of three elements:

1. Students perform self- or peer assessment of the work (optional).
2. The teacher assesses the work according to the rubric, with additional, specific commentary on the work.
3. Students respond to the commentary and assessment.

Element 1: Self- or peer assessment. (See page 43 for a detailed discussion.)

Element 2: Teacher assessment. CTE teachers are now prepared to judge the extent of demonstrated knowledge and skills with relative ease, having clearly defined the expectations for the task. They often use the rubric for the full grading of the performance task, circling the description (or part of the description) that best reflects each student's achievement for each standard and adding comments to point out exceptionally good elements and clarify how the student can improve.

Element 3: Student response. If the process stops here, however, the student will have learned little from the teacher's feedback. The last step in examining the student's work is to have the student respond to the teacher's comments in writing. The response may be only a paragraph in length and should include the following:

1. A topic sentence that indicates general agreement or disagreement with the teacher's comments
2. Two or three sentences providing examples of why the teacher's assessment was inaccurate or accurate or a combination or both
3. A concluding sentence reflecting how the student will use the feedback to improve future performance

Students should keep the rubric and grade sheet in their portfolios and submit the reflection paragraph to the teacher, who can then record the unit grade.

A second option is for the students to respond to the teacher's comments with an improved version of that part of the performance task. In this type of student response, students can demonstrate that they can perform the skill at the proficient level. For example, if the teacher rated the butt joint in a CD cabinet to be basic because of a one-eighth-inch mismatch in the vertical surface, the student involved might respond to that assessment by submitting an example of a butt joint that has no mismatch in the vertical surface. The teacher could then adjust the grade, completing the learning circle.

Use of Assessment Data to Guide Instruction

Because the instruction process is standards based, using assessment data to modify future instruction is straightforward and consists of the following steps:

1. Identify data sources.
2. Analyze the data, including comparison of expected, ideal, and actual results.
3. Modify instructional strategies immediately.
4. Plan future modifications of instructional plans.

Using the preceding first sample, the entrepreneurship teacher has three sources of assessment data: the test, the portfolio notes, and the performance task. If the teacher has set up the test as suggested, a simple item analysis (a count of how many students got each item correct) will indicate whether or not the instruction worked for each component of the standards. Thus, if half the class failed the

questions on the rationale for business and industry's use of market research but only one student missed any of the questions on advertising strategies, the teacher has a strong indicator that the instruction on the rationale for market research went awry and that on advertising approaches went well.

Similarly, the scores on portfolio notes provide immediate feedback on the effectiveness of the students' notetaking practices and the areas where those skills need to be bolstered to produce better learning and retention. As shown in the chart at the end of this chapter, accurate and efficient notetaking will increase student achievement dramatically. Such item analysis is well worth a CTE teacher's time. The teacher can determine how to prepare students more effectively to view a film or read a textbook assignment and identify ways to improve the clarity of the minilectures.

Finally, the item analysis of the performance task rubric will provide feedback on each standard. For example, if 85 percent of the students scored at the proficient or advanced level on the Marketing, Sales, and Service standard B4.4 ("Understand how market research is used to develop strategies for marketing products or services in a small business"), the teacher has a strong indicator of success in teaching this important pathway standard. That finding should be corroborated by pencil-and-paper test data for those items that relate directly to this standard. If successful, the teacher can move on to the next unit, setting aside a lunchtime or after-school review session for students who still need to master the standard concepts.

However, if the item analysis of the performance task rubric and the test shows that 85 percent scored at the basic or unacceptable level on this standard, the teacher must make a choice. If the standard is fundamental to the course, reflecting core information that the rest of the course builds on, the teacher may need to add another period of time to the curriculum map to reteach and review the key elements and make another assessment. But doing so will require that another standard that is less important will have less time devoted to it later in the year. During the added instruction time, the teacher reviews the previous materials and adds new approaches to explore the concepts in a different way. Because there will generally not be time to do another performance task, the assessment can be a daily quiz, with the information being retaught until 85 percent of the students pass at least at the 80 percent level. Then the class as a whole will move on, and the few students who do not pass are assigned to an out-of-class review.

If the data show a more even division—for example, that half the class mastered the key standards and half did not—the teacher again must determine the importance of the standard. If it represents concepts or skills essential to understanding major parts of the rest of the course or performing the next level of task difficulty, having only 50 percent of students demonstrating mastery is unacceptable. In this case the class may need to be divided into two groups. Those who achieved at the proficient or advanced level are assigned interesting enrichment projects for additional credit, and the others are assigned to work directly with the teacher to review the concept or practice the skill. Use of the daily assessment quiz or task demonstration with this group would provide added incentive

to master the content as quickly as possible. Mastery can also generate points to improve the previous grade.

Another alternative is to divide the class into groups of four students. Two groups that mastered the standards will review the material and concepts with the two that did not. Points might then be awarded as follows: five points to any group of four that can demonstrate mastery by the end of the first day, four points to any group that can demonstrate mastery by the end of the second day, and so forth. In this approach peers who mastered the standards are working to help those who have not mastered them to do so as quickly as possible. This group work not only helps students master pathway content but also gives them opportunities to practice and expand on the skills and knowledge contained in foundation standard 9.0, Leadership and Teamwork.

All of these examples offer ways to differentiate instruction in the classroom. Techniques for differentiating instruction at the individual student level are addressed in Chapter 3.

Off-Campus Work-based Learning

Off-campus work-based learning has been a mainstay for many CTE students. Recent studies have shown that this type of learning has significant nonacademic benefits.[9] Thus, it may be useful initially to focus on the the use of the CTE pathway standards in work-based learning settings.

Using the pathway standards as the basis of off-campus work-based learning is relatively easy to implement. In fact, the existing structure often includes legal mandates for an agreed-upon set of objectives for the student to master during the work-based learning period. The key to success is to choose the appropriate standards for the work-based learning assignment and then align the objectives with the standards. A clear understanding between the teacher, student, and employer or supervisor about the level of mastery required for each objective and the indicators of that mastery is essential.

The teacher must be aware of the legal requirements affecting agreements that apply to the specific type of work-based learning. Such agreements must be developed in compliance with the California *Education Code* and state and federal child labor laws.

Integration of Foundation Standards

As the examples in this chapter demonstrate, using the foundation standards to bolster CTE rigor is highly effective. That approach is promoted by the Southern Regional Education Board (SREB) in *Designing Challenging Vocational Courses.*[10] Long-time advocates of including CTE in every student's course sequence, SREB paraphrases the California Department of Education's definition of CTE, stating that "the primary role of career and technical programs is to prepare youths for careers and further study by raising students' achievement in technical literacy" in order to:

1. Encourage less-motivated students to persevere in high school by showing them the path to higher-paying jobs.
2. Allow students to experience real-world applications of higher math and science.
3. Open vistas of opportunities.[11]

Inclusion of the high-level foundation standards in all CTE courses ensures that students, possessing both academic and career technical skills and knowledge, will be well prepared for success in the twenty-first century labor market. The Education Trust notes the following:

> The technical reading and computational skills required for jobs that pay a living wage are remarkably similar to those required for credit-bearing college courses. The ever-popular myth of the hard worker who can't read well or divide fractions but owns his own air-conditioning repair company is just that—a myth [for today's students].[12]

This focus on jobs with reasonable pay and benefits in the future labor market is fundamental. There are, and will be, millions of low-paying jobs in America, but the mandate for CTE change comes from a focus on high-wage, high-demand positions.

What does increasing the focus on rigorous foundation standards look like in CTE? The answer is in integrating foundation standards with pathway standards. If the sheer number of foundation standards seems daunting, teachers might initially choose from those that align with the National Research Council's list of skills required by business and industry in which secondary and postsecondary educational institutions must provide instruction as follows:

1. Understanding and meeting customer needs (directly related to foundation standard 2.0, Communications)
2. Accessing pertinent information regarding the job in multiple and time efficient ways (directly related to foundation standard 3.0, Career Planning and Management)
3. Identifying and solving problems through research, critical thinking, troubleshooting, and decision making (directly related to foundation standards 1.0, Academics; 2.0, Communications; 4.0, Technology; 5.0, Problem Solving and Critical Thinking; and 6.0, Health and Safety)
4. Being able to work alone and in teams (directly related to foundation standard 9.0, Leadership and Teamwork)
5. Applying knowledge and experience to a wide range of activities (directly related to foundation standard 7.0, Responsibility and Flexibility)
6. Understanding corporate and business cultures and systems (directly related to foundation standard 8.0, Ethics and Legal Responsibilities)
7. Seeking lifelong learning and upgrade of skills (directly related to foundation standard 3.0, Career Planning and Management)[13]

In the foundation standards section in each industry sector, the first two standards, Academics and Communications, list the academic standards that CTE courses in that sector address as chosen by business and industry representatives

working with teachers in the field. Although not all sectors or pathways require integration of advanced-level academics, most call for eleventh- and twelfth-grade reading, writing, and analysis skills. Many require in-depth understanding of concepts found in history–social science, science, mathematics, and the arts. This need for integration has profound implications for professional development, as discussed in Chapter 3.

Integrating foundation standards with the unit assessment is discussed in Chapter 1. But the richness of the CTE curriculum allows for this integration to occur daily. Indeed, the remarkable advantage that CTE courses have in teaching foundation standards has long been recognized. That is, CTE can teach foundation skills through application. Most students—indeed, most adults—learn best by doing, and CTE courses offer that opportunity in ways that traditional courses can seldom equal. As Jim Canales, president and chief executive officer of the James Irvine Foundation, states: "We need to promote programs of study that blend academic rigor and real-world learning if we hope to inspire more of our youth to stay and succeed in school."[14]

Foundation standards in CTE promote students' adaptability and ability to transfer skills. This kind of flexibility and adaptability is important to the long-term value of CTE skills in the workplace. Students may master foundation skills in one context but not realize that these skills can be transferred to greater applications. Using the techniques discussed in this chapter can help improve students' ability to apply foundation knowledge and skills in a variety of situations.

For example, Agricultural Mechanics students learn how to determine the amount of oil to mix with gasoline, given the capacity and requirements of a small engine (related to Agriculture and Natural Resources standards B10.1 ("Understand engine theory for both two- and four-stroke cycle engines") and B10.3 ("Know small engine parts and explain the various systems [e.g., fuel . . .]"). In teaching how to determine the appropriate ratio of oil to gasoline, the CTE teacher might first clearly identify the activity as addressing foundation standard Academics 1.1 Algebra I (grades eight through twelve) 15.0 ("Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems"). The teacher could then have students complete a series of percent mixture problems, requiring them to set up the problem as an algebraic equation and solve for the unknowns. Thus, the student is much more likely to make the link between the application in CTE and the problems in algebra.

Of course, the opposite is also true. That is, teachers of academic subjects will enhance their students' chances of standard mastery by using explicit examples from CTE. Applying concrete examples to abstract concepts and ideas enhances understanding and retention in all fields. This is yet another reason why collaboration between CTE and other disciplines can result in higher achievement for all students. Collaboration will also ensure that every student has opportunities to build a strong foundation of academic skills and a broad range of technical skills, as recommended by many studies, including *Building for Tomorrow: Industrial and Technology Education in California*.[15]

Strategies for Transferring CTE Skills to Academic Applications

Foundation standards instruction in CTE can become highly transferable to academic situations, including such academic tests as *CAHSEE* and *STAR,* and vice versa if the connection is transparent to the student. Just as academic teachers strive to engage their students with examples of how their subjects are relevant in the real world of careers, CTE teachers can make explicit connections to the academic content in their courses. The primary mechanisms for accomplishing this are (1) using common language and constructs; (2) making frequent, clear connections for the students orally and in writing; and (3) arranging for students to receive extra credit or other recognition in the appropriate academic class.

1. *Using common language and constructs.* This approach is the easiest way to make the connection between authentic CTE and theoretical academic learning for students. Academic teachers and CTE teachers need to recognize and value the vocabulary that each has to offer. For example, if an English teacher calls the controlling sentence in a paragraph a *thesis sentence* and a CTE teacher calls it a *topic sentence,* students in both classes will be confused. By using the same terms for the same concepts, both teachers will ensure that the students are learning words that are accurate and workable in multiple settings, thus increasing the students' flexible thinking and transferability of skills.

   Using common constructs is perhaps even more important than using common language in developing transferable skills. For example, if a CTE teacher requires students to take notes on lectures, readings, and videos by using the Cornell notetaking method and the history–social science and English teachers are using outline notetaking formats, the students will likely not succeed with either method. Common constructs or formats should be adopted throughout the school, especially for such common skill areas as writing paragraphs, learning vocabulary, taking notes, and summarizing.

2. *Making frequent, clear connections for students orally and in writing.* Such attempts keep the link between the knowledge and skills in the CTE pathway standards and foundation standards in the forefront. Several techniques make the effort easy to do on a daily basis:

   The CTE teacher may wish to include the foundation standards, written out completely, in every appropriate assignment. In that way, as in the example about small engines, Agricultural Mechanics students receive the first connection message immediately when they see the CTE pathway standard B10.1 ("Understand engine theory for both two- and four-stroke cycle engines") and standard B.10.3 ("Know small engine parts and explain the various systems [e.g., fuel, ignition, compression, cooling, and lubrication systems])," followed directly by Academics 1.1 Algebra I (grades eight through twelve) 15.0 ("Students apply algebraic techniques to solve rate problems,

work problems, and percent mixture problems") in their assignment.

The CTE teacher might also point out the connection directly. Telling students that they are using algebra skills as they perform tasks or making the equations and processes explicit in the instruction allows students to gain a deeper understanding of the process as a fluid and adaptable set of criteria that includes algebraic calculation.

In the written assignment given to students, after listing the CTE pathway and foundation standards addressed in the assignments, the teacher might write the following: Correct application of algebra standard 15.0 is essential to the mastery of the Agricultural Mechanics standards and will carry significant weight in the grading of this assignment.

3. *Arranging for students to receive extra credit or other recognition in the appropriate academic class.* Credit or other recognition can demonstrate to students who view academic and CTE disciplines as discrete that they are in fact an interrelated whole. Thus, a Health Occupations teacher who requires a research paper that includes at least four sources according to the APA format might arrange with the English teacher to grant credit for the report to students in English classes in grades eleven and twelve, where standards for research papers are emphasized. Reciprocally, teachers in academic subjects may solicit suggestions for CTE topics and examples for academic class research assignments, and in turn the CTE teacher may request that students submit copies of their research reports for extra credit in the CTE class.

Skills Needed to Pass the *California High School Exit Examination*

There are several ways in which CTE can provide value-added instruction in English–language arts and mathematics to help students pass the *California High School Exit Examination (CAHSEE).* CTE has exceptional capacity to teach the skills tested, including the English–language arts and mathematics portions of the examination. CTE teachers use the kind of practical, job-related materials that form at least 50 percent of reading items on the *CAHSEE,* and most of the *CAHSEE* mathematics items reflect sixth- and seventh-grade standards rather than algebra, which is often the lowest-level course taught in high school. The practical mathematics reflected in most *CAHSEE* test questions is exactly the type used in many CTE courses.

1. *Incorporating CAHSEE-level English standards in CTE.* The interdisciplinary focus on reading and writing is essential to CTE success. Students in the twenty-first century American workforce must have significant literacy skills to obtain and maintain employment in practically every pathway in every sector.

Willard Daggett's International Center for Leadership in Education has published a white paper detailing the reading levels of average high school students,

typical high school textbooks, and entry-level career technical reading materials.[16] The paper uses Lexile ratings to indicate the level of difficulty in textbooks, considering elements such as vocabulary and syntax. Examples include *Frog and Toad Are Friends* at a Lexile rating of 410, *War and Peace* at 1200, and *The Scarlet Letter* at 1400. The following charts summarize Lexile ratings for high school students and typical high school textbooks and reading materials. In each case the middle 50 percent is reflected in the sample, leaving out both lowest and highest achievers and the easiest and most difficult textbooks.

Grade	Lexile reading level for middle 50 percent of students	Lexile text level for middle 50 percent of course reading materials
9	855–1165	1050–1150
10	905–1195	1100–1200
11–12	940–1210	1100–1300

Note that the Lexile ratings for students in the preceding list are for the middle 50 percent. The average Lexile levels of entry-level job materials in 13 careers are shown in the following chart:

Entry-level career technical reading material (alphabetical)	Lexile level	Entry-level career technical reading material (alphabetical)	Lexile level
Agriculture/Natural Resources	1270–1510	Architecture/Construction	1210–1340
Arts/Communications	1100–1190	Business and Administration	1210–1310
Education/Training	1320–1370	Health Science	1260–1300
Hospitality/Tourism	1230–1260	Human Services	1050–1200
Law/Public Safety	1420–1740	Manufacturing	1200–1310
Retail/Wholesale Sales/Service	1180–1270	Scientific Research/ Engineering	1190–1250
Transportation/Distribution/ Logistics	1170–1350		

Because of the disparity between high school students' reading levels and levels of difficulty in textbooks, the first and most intense interdisciplinary focus for CTE should be on reading. Students must be able to read and comprehend the materials in CTE classes, especially the materials they must use to be successful in entry-level positions in their career pathway.

2. *Incorporating CAHSEE-level mathematics into CTE courses.* A significant problem high schools face in preparing students to pass the *CAHSEE* is the mismatch between courses offered at the high school level and the material tested in the mathematics section. The *CAHSEE* mathematics section tests skills in general mathematics, pre-algebra, and approximately the first third

of a typical Algebra I course. To pass, students must answer 55 percent of all questions correctly. Given the usual distribution of items, a student can pass the mathematics section without answering any Algebra I content questions correctly but cannot pass without having a sound understanding of general mathematics and pre-algebra concepts.

This mismatch problem occurs because most California high schools no longer offer a course with content lower than Algebra I. Instead of being offerred remedial classes, lower-achieving students are provided simultaneous support courses to help them pass Algebra I. Only a few students receive direct instruction in general mathematics, usually in an after-school tutorial program in the ninth grade only. By the spring of the tenth grade, when they first take the *CAHSEE,* students are generally at least two years away from any direct instruction in the bulk of the material for which they must demonstrate mastery to pass. For many that amount of time is excessive. However, CTE can provide significant assistance to those students who need help.

Workers engaged in most real-world occupations require skills in mathematics that are used daily, such as the following:

- The interior designer, who must measure and graph rooms, furniture, and appliances with total accuracy
- The roofer, whose profit margin depends on accurate estimates of roofing felt and shingle requirements
- The utilities or transit project manager, who must work within budget constraints to retain his or her job
- The nursing assistant, who must accurately measure the amounts of medications or risk the lives of patients

CTE instructors teach and assess these essential skills that reflect many of the standards tested on the *CAHSEE.* Simply by virtue of being enrolled in CTE classes, students are receiving instruction in key mathematics skills tested on the *CAHSEE.*

Teachers can also incorporate general mathematics into the daily process of CTE classroom management. Research indicates that all teachers should be delivering the following message to students: *Inspiration (ability) + perspiration (hard work) = success.*[17] One way to do so is to give students a rubric for effort and have them chart all their work—homework, quizzes, performance tasks, tests, and more—to show two scores, one for effort and one for achievement. The chart should be kept in the student's portfolio. To create a nonlinguistic representation of this linkage between effort and achievement (and to teach graphing skills), students should turn their chart data into a personal-best graph that clearly shows the linkage. As with other graphs of real-life data, the results will not be absolutely linear; but over time, especially as students begin to be more honest about their level of effort, and especially if the instructor rewards personal-best achievement, the student connects hard work and achievement. In addition, the exercise causes the student to review and practice graphing skills, which are tested on the *CAHSEE.*[18]

Interdisciplinary Projects

Interdisciplinary projects within CTE. Creating interdisciplinary projects within CTE was addressed earlier in this chapter, when the step-by-step process for blending academic foundation and pathway content standards was delineated in a performance task or project. Additionally, many CTE advanced or capstone courses require extensive interdisciplinary projects. An example is Career Service, which provides opportunities for CTE students to work with a local community-based organization or government agency to create a project to meet community needs and address rigorous CTE standards in the pathway.

Interdisciplinary projects involving CTE and academic teachers. Interdisciplinary projects usually involve several teachers who agree to have one performance task constitute a credit assignment in multiple classes. A typical example involving CTE and academic teachers occurs when a geometry teacher collaborates with a residential construction teacher to develop an interdisciplinary unit plan addressing standards related to angles and load-bearing ratios in the context of rafters and roof beams. These types of interdisciplinary projects are most easily accomplished under one of three conditions:

1. *Integrated timelines.* If the CTE course is required in a certain grade (e.g., computer applications in ninth grade), it is relatively easy to have the students learn keyboarding and software applications by using word processing in preparing papers or other writing assigned in English 9. Similarly, students may create graphs for papers, mathematics assignments, or laboratories while they are learning a spreadsheet or database program. In each case the teachers collaborate on the timeline and requirements.
2. *Student choice in academic assignments.* In this project academic teachers allow students to determine certain elements of their assignments. To make the effort work, schools must set aside time at least quarterly for teachers to exchange information on their upcoming major assignments and determine whether there are opportunities for interdisciplinary projects. For example, the CTE teachers might be notified that the tenth-grade English teachers will be teaching Writing Standard 2.9 (business letters) in the last three weeks of the semester and are willing to let students choose the letter topic. The CTE teachers can then assign a business letter appropriate to their curriculum that is due at a certain time and allow students credit in both classes.
3. *Team teaching.* This approach is seen almost exclusively in magnet schools or career academies where the academic and CTE teachers have integrated their curricula completely. In this case the assignments are always dual. For example, a student might take English 10 and Introduction to Health Careers, a two-hour class taught by a team consisting of a CTE teacher and an English teacher with 60 students. All text—fiction, expository, drama, textbook, poetry, biography—has health careers as a dominant feature, and all are analyzed from the perspective of CTE content, literary attributes (if appropriate), and qualities of the writing.

Research-based Instructional Strategies

Effective instructional strategies make the difference between an exciting, motivating course and one that fails to engage students. Because the authentic nature of CTE is motivating in itself, the use of such strategies as simulation, modeling, demonstration, and guided discovery is natural to CTE instruction.

The concept of work teams whose members amplify each other's skills and incorporate peer teaching as part of the daily routine is a strategy used in virtually every industry and is almost universally appropriate and effective in CTE. Perhaps most important is the metacognitive instruction—the clear emphasis on understanding *how* to learn—that permeates CTE classrooms and laboratories and helps prepare students for the flexibility and on-the-job learning that dominate the modern workplace.

In addition to these instructional strategies prevalent in virtually all CTE classrooms, other research-based classroom strategies can be extremely useful for delivering standards-based CTE in optimally effective ways.

The research used in the following section is taken from *Classroom Instruction That Works* (1997) and *A Handbook for Classroom Instruction That Works* (2001), both published by the Association for Supervision and Curriculum Development. At the Mid-continent Research Education Laboratory, the authors conducted a series of meta-analyses of hundreds of studies on effective pedagogy to determine which instructional strategies have the maximum positive effect on student learning. The results in the following chart can be used by CTE teachers as a guide to increasing learning in both CTE and academic content areas.[19] The chart shows the instructional strategies that are most effective, the average effect size, the translation of the effect size into percentile gain on a standardized test, and the number of effect sizes or studies included in the analysis.

Categories of Instructional Strategies That Affect Student Achievement Positively

Category	Average effect size	Percentile gain	Number of effect sizes or studies
Identifying similarities and differences	1.61	45	31
Summarizing and notetaking	1.00	34	179
Reinforcing effort and providing recognition	.80	29	21
Homework and practice	.77	28	134
Nonlinguistic representations	.75	27	246
Cooperative learning	.73	27	122
Setting objectives and providing feedback	.61	23	408
Generating and testing hypotheses	.61	23	63
Questions, cues, and advance organizers	.59	22	1,251

Effect size is a statistical measure used by researchers to quantify the difference that the use of a particular strategy or intervention makes in the outcome. For educators, then, the effect size shows the positive (or negative) achievement resulting from the use of the particular strategy. No change in the strategies used would result in an effect size of zero. An average effect size of 1.00 means that the achievement of students consistently and effectively exposed to the strategy discussed will result in a 34 percent gain on a standardized test in comparison with similar students taught the same material without the use of the strategy. Thus, a CTE instructor can increase the effectiveness of instruction and student learning dramatically by incorporating the strategies identified in *Classroom Instruction That Works* and *A Handbook for Classroom Instruction That Works.*

Conclusion

Assessment is fundamental to CTE standards-based education. Well-designed assessments focus on both foundation and pathway standards. For authentic or project-based assessment, the performance task is clearly presented to the students, together with a detailed rubric and an exemplar for each part of the task. Examples of this format for every pathway appear in Part II. Combining standards-based assessment with research-based instructional strategies will maximize learning for all students and showcase CTE's increasing rigor and effectiveness.

Because of CTE's hands-on, performance-oriented instructional methodology and the inclusion in CTE courses of applied instruction in *CAHSEE*-tested skills in mathematics and in the reading of nonfiction materials, career technical educators can be significant contributors to a school's providing a safety net in preparing for the exit examination.

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Chapter 3

Administrative and Support Services

Planning for career technical education (CTE) in the schools needs to be conscious, comprehensive, and ongoing. Admittedly, individual departments and teachers may be able to build strong CTE programs in a less-structured environment, but only a whole-school CTE plan can ensure that these vital programs are effectively accessible to all students.

Although the CTE plan can be considered as a separate document, the criteria established in the California Department of Education's Exemplary Career Technical Education Awards, part of the California School Recognition Program, state that the essence of the plan should be carefully integrated with other schoolwide plans, such as the single-site plan for student achievement, the school's safety plan, the WASC (Western Association of Schools and Colleges) action plan, and any other official document representing the whole school. Comprehensive CTE planning also includes those elements required for federal funding, such as the traditional Perkins plan.

Finally, CTE planning must reflect articulation beyond the single school site. Alignment of middle school courses will ensure a smooth transition between the introductory skill set mastered at that level and the concentration courses at the high school level. Lack of articulation can result in duplication of instruction in the standards or gaps in essential learning that can cripple effectiveness. Similarly, smooth transition to postsecondary training or education, such as that provided by community colleges, apprenticeship programs, and trade schools can be greatly enhanced through alignment of the curriculum.

Components of CTE Planning

CTE planning for administrative and support services, as well as curriculum and instruction, is a powerful tool for ongoing improvement. Plan components important to the success of a comprehensive CTE strategy are the following: (1) universal access; (2) financial support; (3) internal and external review; (4) professional development; (5) career awareness and guidance; (6) student scheduling; and (7) student recruitment and enrollment.

Also essential are course articulation and alignment, topics treated in depth in Chapter 4. Developing and implementing planned strategies for those elements ensure that a school's CTE programs will grow and thrive.

Component 1. Universal Access

CTE planning must include a strong focus on *all* students' readiness to succeed in academics and in the twenty-first century labor market. Entry into the labor market may occur during school, after graduation, during or after postsecondary education or training, or even after receiving a degree and returning to a community college (reverse transfer). A well-conceived CTE plan will provide a strong foundation no matter when a student chooses to join the workforce. The school's clear focus on exceptional achievement for *all* students will benefit everyone.

Consideration and accommodation of the needs of every student are termed *universal access,* which means more than providing access to a course. Equality of opportunity extends to providing physical and instructional adaptations to meet students' individual learning needs—whether primarily for support to complete basic classes or for additional challenges in the traditional system. An effective universal access approach for CTE requires planning, attention, and application of resources. Because differences among students are not always immediately obvious or easily addressed, CTE teachers must identify and meet multiple and sometimes conflicting needs within a single class.

Students needing additional support or alternative approaches. Students struggling or falling behind in CTE courses—or perhaps not enrolling at all—may be experiencing difficulties for a number of reasons, including various learning disabilities, limited English proficiency, issues related to gender equity or nontraditional careers, or lack of background knowledge or skills due to socioeconomic status.

Students with documented special needs. Students identified as having special needs will have 504 plans or individualized education programs (IEPs), as required by law.[1] These plans may call for modifications, either curricular or adaptive, to provide these students with equal learning opportunities. Many resources are available to CTE teachers to help implement 504 plans or IEPs. Funding and space for adaptive technology and other physical accommodations will be provided as necessary to meet the specifications of those plans. Special education teachers at the school, local specialists, the child's parents, and other members of the IEP team will help CTE teachers understand how best to meet a student's needs. Teachers who suspect that a student may have an undiagnosed learning disability should make a referral to the designated person on campus—a school psychologist, a special education teacher, a counselor, or an administrator. Teachers may request screening tests or a meeting of the student study team.

English learners (ELs). CTE teachers employ various instructional techniques to reach students experiencing different levels of comprehension and fluency in English and may meet with the EL teacher or specialist in the school or school district for ideas about support and curricular modifications, for example. The CTE teachers must be prepared to address the needs of increasing numbers of California high school students who are ELs. (Strategies described in Chapter 9 of the California Department of Education's publication *Aiming High* may be

helpful.) The teachers must also be especially sensitive to language and cultural issues affecting student performance and recognize situations where cultural differences or language barriers are inhibiting understanding.[2] In this area CTE has a particular advantage over many traditional academic subjects because of its effectiveness in providing several modes of learning and assessment. CTE students can demonstrate their understanding not only through language-based assessments, such as written tests or oral examinations, but also through performance- or project-based assessments. CTE has opportunities to assess understanding in ways less dependent on English literacy and, simultaneously, increase English-language skills through instruction in the subject area.

Gender equity. Schools need to recruit students of both genders for CTE programs. As delineated in the foundation standards, the value of diversity and the importance of gender equity are key items to be emphasized during recruitment. Unspoken stratifications between students "destined" to become blue- or pink-collar workers and those "suited" to white-collar professions can develop early and affect student enrollment and performance in CTE and academic courses. Well-planned recruitment and retention efforts can help prevent these divisions from developing. Although significant inroads have been made, women in the workforce continue to dominate many of the careers with the lowest pay and fewest benefits and are a notable minority in many highly paid, high-status careers.

Gender-equity initiatives help schools to serve all students better through improved compliance with laws governing gender equity and civil rights, elimination of sex bias in teaching practices and curriculum, and support for instruction in gender-equitable CTE. The Columbia Education Center maintains a Web site at http://www.col-ed.org/resource_page.html that lists many excellent gender equity and nontraditional CTE resources for schools, including the following:

1. The Midwest Equity Assistance Center at http://www.meac.org/index.html houses a comprehensive library of resources that individuals can borrow.
2. The Equity Center at Northwest Regional Education Laboratory at http://www.nwrel.org/cnorse provides technical assistance and support in implementing gender-equitable career awareness/exploration.
3. The American Association of University Women at http://www.aauw.org provides programs, materials, and research briefs on gender equity.
4. Campbell-Kidler Associates at http://www.campbell-kibler.com offers user-friendly reports, brochures, and pamphlets.

The following Web sites can provide support for young women considering nontraditional careers:

1. HardHattedWomen.org. This organization was established to empower women to achieve economic independence in nontraditional careers through education, support, advocacy, and job placement and advancement.
2. Tradeswomen.org. Tradeswomen, Inc., is a nonprofit grassroots organization which promotes and supports women in nontraditional blue-collar jobs.

Economically disadvantaged students. Economically disadvantaged students may carry burdens into the classroom that are not immediately evident. For example,

because they may be needed at home to take care of younger siblings periodically on school days, they may fail to attend regularly. Or they may work long hours to help support the family. Others may come to school suffering from hunger or cold, lacking adequate medical or dental care, or experiencing other problems that can impede their learning. These barriers can be identified at the classroom level and referred to a student study team or counselor for community assistance.

CTE teachers can make a significant impact on another barrier that economically disadvantaged students frequently face; that is, lack of background knowledge and skills. Research shows a well-documented connection between poverty and low academic achievement, a reality recognized by California's "similar schools" API ranking. Even when studies are controlled for race and ethnicity, family structure, and the mothers' education, only 37 percent of students born in or near poverty will pass an academic test that 63 percent of students not born in or near poverty can pass.[3]

Robert Marzano has identified two key strategies that directly address the knowledge gap—silent sustained reading and vocabulary instruction. He conducted a meta-analysis of research studies to identify steps to effective vocabulary instruction that can tangibly help level the playing field for economically disadvantaged students. Because specialized vocabulary is a part of virtually every CTE course, economically disadvantaged students will particularly benefit from the following:

1. The teacher provides a description, explanation, or example of a new word.
2. The students pronounce the word and restate the teacher's explanation of the word in writing in their own words.
3. The students create a nonlinguistic representation of the word (diagram, pictogram).
4. The students periodically carry out activities that help them add to their knowledge of vocabulary, such as comparing or classifying words and revising initial descriptions.
5. The teacher periodically asks students to discuss the words with one another.[4]

This approach can substantially help economically disadvantaged students bridge the gap in their background knowledge. It can also increase the retention and depth of understanding of essential CTE vocabulary for all students.

Gifted and talented students. The general public may assume that career selection and training come easily for gifted and talented students—that these students simply identify their special talent and then practically learn on their own. That assumption is not valid. Indeed, it has been said that "gifted and talented students often have problems beyond those of most other students who consider college and career choices."[5]

One problem some gifted students face is *multipotentiality,* the ability to develop any number of career options from their wide variety of interests, aptitudes, and abilities.[6] Having a broad range of interests and opportunities available sometimes increases the complexity of deciding on an industry sector for goal setting and training development. Most often, multipotentiality is found in those who

are academically talented and those who have two or more outstanding but very different abilities, such as proficiency in both ballet and mathematics.

For gifted and talented students with multipotentiality, CTE is one way for them to explore and narrow their possible career choices. "Wheel" or sampler courses in middle school may help the multipotential student focus on two or three industry sectors. A subsequent CTE concentration course may well offer sufficient exposure for the student to decide whether to continue in that pathway or explore another. CTE courses that provide job-shadowing experiences or opportunities through career technical student organizations (CTSOs) for mentoring and competition can sharpen the decision-making process. And gifted students need not settle on a single CTE sector. Counselors may wish to encourage students with significant multipotentiality to explore two very different areas, recognizing that one area may emerge as the career choice and the other as avocational.

Other gifted students may not be faced with multipotentiality but instead be designated as *early emergers,* children or early adolescents with extremely focused career interests.[7] A passion for an idea and an early commitment to a career area is not negative but signals a need to provide training in the skills needed to exercise that commitment. Because students can use CTE courses for that training, counselors should encourage parents to allow students to explore their passion in this way without pressuring the students to perform in their area of interest. Sometimes, early emergers are so passionate about their career focus that they ignore their other courses. CTE teachers can be pivotal to reestablishing a balance for these students, helping them understand the relationship of the required course work to success in their area of expertise or insisting that they perform adequately in other courses to be given special privileges in the CTE course.

Differentiated instruction. Differentiated instruction reflects a teacher's understanding and anticipation of differences in students' readiness, interests, and learning profiles. On the basis of that understanding, the teacher can create different learning options or paths to learning so that all students will have equal opportunities to master the standards. The most common ways of differentiating instruction are the following: (1) pacing; (2) varying the complexity of instruction; (3) grouping based on types of learning issues; and (4) grouping based on types of instruction

1. *Pacing.* Pacing refers to the speed at which the material is covered. CTE teachers can adjust the pace of the class or of groups within the class to conform to student needs, providing extra learning time after school or more direct instruction during class to groups or individuals requiring more time to understand the material. They may also offer supplemental instruction to students who can move ahead earlier with extra projects or enriched materials. The additional instructional time can accommodate more practice, multiple explanations, or slower overall pacing for students needing the extra time.
2. *Varying the complexity of instruction.* Complexity is the depth and detail in which a subject is covered. Varying that complexity complements pacing

and helps teachers manage classes of students functioning at different levels. However, gauging complexity and adjusting instruction accordingly can be challenging. By using materials prepared with differentiation in mind, teachers can manage instruction without increasing their workload in insupportable ways.

Accelerated learners may be encouraged to delve into greater detail on specific topics. If their understanding and interests trend toward the larger picture, they may be asked to discern the abstract concepts behind the standards or the ways in which the material connects to other areas of study. For students who are encountering difficulties, differentiation may entail identifying and focusing on the key skills and main ideas in the material.

3. *Grouping based on types of learning issues.* To aid instructional planning, the teacher may decide to place students in four major groups according to the degree or type of difficulty the students are experiencing: (a) proficient; (b) strategic; (c) intensive; and (d) advanced.[8]
   a. *Proficient.* The proficient group is made up of students who are making adequate progress but may be experiencing minor or occasional difficulties. Addressing the problems in a timely manner can prevent these students from falling behind. For example, students who do poorly on a quiz may join a review group that meets after school or during the next day's class period, and those not having problems may use the time to work on their performance task for the unit. Often, one or two review sessions are all that proficient level students need to get back on track.
   b. *Strategic.* The strategic group consists of students who may be performing at a below-average level but whose learning difficulties can still be addressed by the regular CTE teacher within the classroom environment. CTE tutoring, targeted assignments, and study groups or other opportunities for extended learning time may also be helpful. Some students in the strategic group may need accommodations to the physical environment of the classroom or to the curriculum or instruction as specified in their 504 plans or IEPs. In those instances the district will provide resources for the teacher to make the required modifications.
   c. *Intensive.* The intensive group is made up of students seriously at risk, as indicated by ongoing, severely low performance on one or more measures. Referral to full-course interventions (for example, in reading), a student success team, or a special education specialist (if the student does not already have an IEP) may be helpful in getting these students the more intensive assistance they need.
   d. *Advanced.* Advanced students who master the material easily or quickly may require greater challenge or faster pacing to remain engaged. More-challenging assignments or enrichment opportunities that such students can pursue help maintain their interest and focus. If the CTE performance task rubric includes criteria for judging advanced work, the teachers can build in high expectations for understanding and skill that will appropriately challenge these students.

Planning for the instruction of accelerated or advanced learners in CTE courses is fundamental. Traditionally, high schools have assumed that advanced students would continue on to four-year postsecondary education and that their college or university programs would deal with career development and training. But all students eventually end up in the workforce; and the critical adaptation and application skills that CTE imparts are important for success in all careers, regardless of the "color of the collar." Instructors must plan to adapt their teaching to reach students at all levels of understanding and ability, not just to those who encounter difficulties.

4. *Grouping based on types of instruction:* Flexible grouping can help the teacher address the needs of a wide spectrum of students much more easily. The five types of flexible grouping are the following:
   a. Whole-class instruction is appropriate when the skill or concept being taught is appropriate for most students.
   b. Identified-need and skill-based groups are organized according to the common needs of a group of students.
   c. Cooperative groups are structured by the teacher, represent a heterogeneous blend of achievement levels, and focus on the group and on individual achievement of a specific learning goal.
   d. Groups based on interests or topics provide choice and control to students, enhancing their motivation and enthusiasm for the topic.
   e. Groups based on subject knowledge are developed by placement or prior familiarity with the material being taught.[9]

Although grouping is an excellent facilitator of differentiation, *what students are taught* has a greater effect on their achievement than how they are grouped.[10] Rigorous content is still the most important factor in generating positive student outcomes.

Component 2. Financial Support

CTE planning should include a robust strategy for financial support, including the following: (1) use of federal funds and state allocations; (2) application for federal, state, and private discretionary grant funds; (3) local business support, community philanthropy, and fund-raising; (4) general fund; (5) specific funding for facilities; and (6) specific funding for equipment

1. *Use of federal funds and state allocations.* Historically, federal funding for CTE has been available by application. Beginning with the Smith-Hughes Act of 1917 and currently embodied in the Carl D. Perkins Vocational and Technical Education Act of 2006, this CTE-supportive legislation has most recently focused on integrating academics and CTE; sequencing CTE courses; creating quality programs that prepare students for high-skill, high-wage, and high-demand occupations; and requiring accountability for funding use and core indicators of levels of performance. Success has been measured by meet-

ing benchmarks in academic and skill attainment, school completion, placement and retention, and participation in and completion of nontraditional programs.

School districts have traditionally used federal funding to:

a. Strengthen the academic and career technical skills of CTE students through the integration of academics with a coherent sequence of courses to ensure maximum learning in both areas.
b. Provide students with experience and an understanding of all aspects of an industry.
c. Develop, improve, or expand the use of technology in CTE.
d. Provide professional development to teachers, counselors, and administrators.
e. Develop and implement CTE evaluations.
f. Initiate, improve, and expand quality CTE programs.
g. Provide services and activities sufficient in size, scope, and quality to be effective.
h. Link secondary and postsecondary CTE.

State funding also supplies a noncompetitive allocation through the Agricultural Education Vocational Incentive Grant Program, providing funds to upgrade and maintain existing high-quality, comprehensive agricultural programs.[11] The funding is based on the size of staff, number of students, and the school's rating based on the state's quality criteria. Matching funds are required.

2. *Application for federal, state, and private discretionary grant funds.* The first step in applying for competitive federal, state, and private funds is to find out when grants are available. CTE educators can be notified of the state's education grant announcements by signing up for the e-mail service without charge at www.cde.ca.gov/fg/fo/af/joinlist.asp and of federal grant announcements by enrolling at www.grants.gov. The California Department of Education provides on its Web site both an excellent guide to writing grants (www.cde.ca.gov/fg/fo/we) and a guide to finding funding not sponsored by the Department (www.cde.ca.gov/fg/fo/of/ap).

   Three grants that have provided significant support for CTE programs throughout California are (a) the federally funded Smaller Learning Communities grants; (b) the state-funded Specialized Secondary Program grants; and (c) the California Partnership Academies grants. The grants are briefly summarized as follows:

   a. Information on Smaller Learning Communities (SLC) is available at http://www.ed.gov/programs/slcp/index.html. Many SLC schools in California have included career academies in grades ten through twelve or eleven and twelve as one of their strategies to personalize large high schools and increase student achievement. Funded grantees (see the awards page on the Web site) can be a good starting place for further information.

b. California's Specialized Secondary Program (SSP) has also funded a variety of innovative CTE programs throughout the state that provide students with advanced learning opportunities. The program emphasizes the acquisition of technology skills and their use as a tool for instruction and learning. A few of the CTE programs funded through SSP include the International Business Academy (Arroyo High School), Health Career Plus (Southwest High School), Biotechnology Program (Carlmont High School), Academy of Criminology and Justice (Otay Ranch High School), and Mountain Valley Farm Program (Hayfork High School). (See the full program description at http://www.cde.ca.gov/ci/gs/hs/sspgen.asp.)

c. The California Partnership Academies (CPA) program, an effective school-business partnership, provides academic and CTE training to high-risk students and others in 290 programs across the state. The CPA model, a school-within-a-school program in grades ten through twelve, integrates academics and CTE and establishes partnerships with businesses. Emphasis is placed on student achievement in a curriculum focused on a career theme and coordinated with related academic classes. Features include the following:

   - A voluntary student selection process that identifies interested ninth graders, at least half of whom must meet at-risk criteria
   - A team of academic and CTE teachers, led by one member with released time, who have a common preparation period and who work together to plan and implement or operate the program, using complementary, highly integrated curricula
   - A variety of motivational activities with private-sector involvement to encourage academic and occupational preparation, such as a mentor and internship programs, enhanced curriculum, classroom speakers, field trips, and postsecondary options

Academies generally create a close, even family-like atmosphere, integrate academics and CTE, and may offer paid or unpaid internships to students on track for graduation. Grants require a 100 percent match from the district and business partners. Academies have been carefully evaluated and shown to have positive impacts on school performance. (See the full program description at http://www.cde.ca.gov/ci/gs/hs/cpagen.asp.)

3. *Local business support, community philanthropy, and fund-raising.* CTE programs excel in generating local business and community support. Innovative fund-raising strategies, such as an auction of a student-built home, tax preparation services, and cake sales enrich many programs with opportunities rarely available otherwise.

   In addition to fund-raising, special groups generously support some specific CTE programs, and some high schools feature CTE booster clubs. Advisory committees may also generate resources for CTE in addition to carrying out their other essential functions. Some CTE programs that have a lengthy his-

tory in the community are now forming alumni programs with annual dues, recognition dinners, and other opportunities for support and involvement. And service clubs sometimes adopt CTE programs, supporting them with ongoing resources and funding.

4. *General fund.* Use of general fund monies to support CTE is common in many districts. Because CTE is the primary delivery method for districts to meet their *Education Code* mandate to prepare students for success in the world of work, school boards can demonstrate their commitment to education for careers through adequate general-fund allocations for CTE.

5. *Specific funding for facilities.* Resources for facilities renovation or expansion present a challenge. Schools and school districts generally prefer to construct classrooms and other facilities with maximum flexibility for use. Although many CTE courses can operate the school-based portion of their programs in a traditional classroom, others cannot. If the district is planning an application for a large construction or modernization project, *Education Code* Section 17070.95 requires certification that the district has consulted with the CTE advisory committee (established pursuant to *Education Code* Section 8070) about facilities needs and that it has adequately considered its need for vocational and career technical facilities. Although the findings are only advisory, they still constitute an important element of the planning and approval process for facilities.

   Another possible source of building support is qualified zone academy bonds (QZABs). Available periodically through federal funding, these bonds offer no-interest loans, to be paid back in 20 years. The funds may be used for equipment or facility renovation for CTE programs with strong business connections. (See www.cde.ca.gov/ls/fa.)

6. *Specific funding for equipment.* Maintaining and replacing equipment are an ongoing budgetary challenge in many CTE programs. In addition to using state and federal allocations or grants for equipment, some schools have turned to their advisory committees, parents, or alumni for assistance, such as being given donated equipment or equipment deeply discounted in price and free labor on repairs. Others have joined countywide or regional buying consortia to get the best prices possible. Still others are buying well-maintained used equipment from local or online sources.

Component 3. Internal and External Review

Importance of consistent cyclical assessment and improvement. Perhaps the single most effective strategy to ensure improvement over time is a consistent cycle of internal and external review. Indeed, it is virtually impossible to create lasting improvements without this concerted effort. Planning for cyclical assessment, data analysis, data-based decision making, and subsequent alterations in practice and policy becomes the bedrock of effective change for improvement.

Data-based decision making. CTE program decisions should be based on solid information about program needs and performance. Consideration of CTE program performance should include an annual review of at least the following school-level data:

1. Percentage of students completing a CTE course and percentage completing a CTE sequence of two or more courses
2. Percentage of CTE sequence completers who graduate
3. Percentage of CTE sequence completers placed in apprenticeship, military training, postsecondary education and training, or employment
4. Enrollment and completion of students in nontraditional careers compared with the total CTE population
5. CTE students' *CST, CAHSEE,* and local test scores compared with those of the total school population
6. Level of school district and other fiscal support for CTE

The school will also want to examine data at the course and individual program levels, including enrollment categories of ethnic and racial, special needs, gifted and college bound, and gender, to clarify the extent to which efforts to recruit all students into CTE are being successful. It is especially important to consider equity enrollment in courses leading to high-skill, high-wage, high-demand jobs.

The purpose of the annual data-based review is to consider CTE performance in light of the school's CTE goals, adjust planning as needed to reflect the previous year's performance, set new goals, and create an action plan to address those goals. Thus, the data-based review, the formative assessments, and CTE planning are all part of the CTE program improvement cycle included in the school's annual strategic planning efforts.

Formative analysis. Formative analysis allows the school and CTE departments to examine what is occurring in classrooms and how instruction might be improved to accelerate student mastery of CTE standards. Analysis meetings may include business and industry representatives and other community partners; but all meetings should include the CTE department teachers and the site administrator in charge of curriculum. The sessions should be integrated with the school's inquiry and improvement cycle.

A typical formative analysis session might focus on a single CTE pathway. Stakeholders meet to:

1. Review the program sequencing, the foundation and pathway standards to be addressed in each course, the benchmarks for achievement in each standard, and the emphasis on individual standards, as reflected in the pacing guide.
2. Analyze information and materials provided by the instructors and advisory group members attesting to the relative level of implementation and level of student mastery of the standards addressed in each course.
3. Make recommendations for midcourse alterations if needed.

Questions raised might include the following:

1. Will the program offer all the courses listed in the course of study over a two-year period?
2. Are current courses following a pacing guide that ensures adequate time for mastery of key foundation and pathway standards?
3. Do the foundation and pathway standards chosen adequately reflect industry standards?
4. To what extent are academic and CTE teachers collaborating in the program?
5. To what extent have the students as a whole demonstrated mastery of each foundation and pathway standard taught to date? What evidence shows mastery?
6. What implications do responses to questions two and five have for the balance of the year?
7. If problems are evident, what is the cause? Lack of materials? Incorrect benchmarks? Faulty pacing guide? Ineffective instructional strategies?
8. What precisely needs to be done to address the cause of the problems? Who will attempt to solve the problems?

This process will provide not only an effective improvement cycle but also key data for the promotion of CTE. By regularly collecting a variety of information on CTE program performance and analyzing the results, schools will have powerful data to demonstrate the following:

1. CTE courses are up-to-date and aligned with industry standards so that businesses can be assured that entry-level workers are well prepared for the world of work.
2. CTE teachers are using research-based strategies in classroom instruction and applying best practices.
3. Students underachieving in mathematics and/or English–language arts are getting important, standards-based skill instruction in areas relevant to the *California High School Exit Examination* through CTE courses.
4. Rigorous CTE courses are preparing students to be successful in high-skill, high-wage, high-demand jobs and postsecondary training and education.

These outcomes will corroborate the information collected in the data review and formative analysis. They may also bolster arguments for the maintenance or expansion of CTE programs and projects or for additional staff development. The process of tracking and analyzing this information on a regular basis gives schools a built-in source of longitudinal data to use in compiling reports, writing grant proposals, and disseminating information about CTE program successes to students and parents during recruitment and enrollment.

Component 4. Professional Development

CTE staff recruitment and hiring. The recruitment and hiring of excellent teachers is fundamental to increasing CTE course rigor and improving student achievement. Indeed, the skill of the teacher is generally cited as being the primary factor in student learning.[12] *California Standards for the Teaching Profession*

details the level of competency all teachers should demonstrate in the classroom.[13] Clearly, it is the responsibility of all stakeholders to ensure that CTE teachers meet the state standards by possessing the following:

1. Depth of knowledge, experience, and application in the industry sector
2. A deep understanding of the foundation standards
3. Mastery of effective instructional strategies

As in most disciplines recruitment and hiring are easier in some CTE industry sectors than in others—and in some years more than in others. For example, during technology sector downturns in the Silicon Valley, teachers of information technology are easier to attract in the Bay Area than when business is soaring. Even in sectors and years of relatively easy recruitment, CTE programs benefit from the most aggressive, creative recruitment strategies possible. For example, in addition to postings on EdJoin and similar Web sites known to professional teachers, CTE recruitment efforts might include the following:

1. Advertising on general employment sites
2. Offering workshops for students in teaching institutions and preservice programs
3. Conducting local hiring campaigns by distributing posters and advertising in newspapers and other low-cost options
4. Collaborating with surrounding school districts and county offices to hold hiring fairs
5. Supporting preservice and in-service CTE leadership preparation
6. Working with CalTeach programs to grant credentials to excellent candidates
7. Providing two-year induction programs for new teachers
8. Offering a pay differential to attract excellent teachers from industry

Professional development goals. Professional development for CTE teachers should begin with a goal in mind, especially because the time for such development is extremely limited. Many other critical issues compete for the time available.

CTE teachers need to ensure that their clearly defined professional development needs are included in the school's CTE planning. Those needs should also be reiterated to the principal or district personnel who make professional development decisions, usually a year in advance. Teachers requesting professional development based on their site plan should consider proposing definitive outcomes for the training they wish to pursue. Outcomes should focus on the *results* of the training and be measurable so that teachers can prove that professional development made a difference in the quality of their CTE instruction.

Possible goals for CTE professional development and accompanying outcomes include the following:

1. *Implementing best practices in classroom instruction.* This area is important to the whole school, with outcomes designed for all teachers. Because schools or school districts frequently sponsor this type of professional development, they will also probably develop the outcomes, which might include such items as the following:

   a. Teachers will demonstrate the use of graphic organizers and other nonlinguistic representations in their daily instruction as demonstrated by a review of their weekly lesson plans.
   b. Teachers will increase the diversity of their instructional strategies in modeling and demonstration as reflected in classroom observations or walk-throughs.
   c. Professional development in reading across the curriculum will result in students' increased ability to comprehend course textbooks and materials as indicated by the *California Standards Test* reading scores and teacher surveys.

2. *Integrating foundation standards with CTE courses.* This professional development goal, targeted directly to CTE teachers, needs to contain clearly projected outcomes beneficial to the students and the school to persuade administrators of the importance of additional training. Examples of such outcomes might include the following:
   a. CTE teachers will coordinate with academic teachers to produce at least one interdisciplinary project per class per semester.
   b. CTE teachers' lesson plans will reflect the integration of foundation and pathway standards in each unit and performance task.
   c. All CTE teachers at the school will use at least two specific strategies from the foundation standards training in their classes each week as demonstrated in their lesson plans.

3. *Staying current with business and industry innovations.* Because this form of professional development varies extensively according to industry, discipline, educational background, and specialty, each CTE teacher will need to develop a personal outcome from this experience to bring back to the classroom. Such an individual outcome may be structured as follows:

   As a result of my professional development activity, an externship with a local utility company. I will revise my curriculum in the areas of [teacher fills in details here] to update my instruction to align with current practice in the field.

Making time for CTE professional development and collaboration. It has been stated that "time has emerged as the key issue in every analysis of school change appearing in the last decade."[14] Teachers will probably need "*more* than 20 percent of their work time for learning and collaboration if they are to be successful in implementing ambitious reform initiatives."[15] To generate enough time for CTE teachers to collaborate and have access to professional development, schools may choose to integrate these activities with the regular school calendar rather than restrict them to professional development days.

Researchers and practitioners offer a number of strategies to create more time for professional development, including the following:

1. *Using "buy-back" days.* Schools frequently schedule nonstudent days for buyback professional development. Although teachers are not required to attend, they are generally offered compensation at a daily rate as an enticement to at-

tend. Buy-back days are often scheduled on holidays, such as Columbus Day, or at the semester break.[16]

2. *Releasing students on other days.* Schools in excess of the legal requirement of 64,800 instructional minutes per year (or the school's required total if greater) may schedule some morning or afternoon periods solely for professional development at no additional cost. However, this approach provides relatively small blocks of time and may be resented by parents unless it occurs on a regular schedule.

3. *Purchasing teachers' time by using permanent or semipermanent substitutes.* The advantages to this approach are clear. It provides professional development during the school day and guarantees the presence of substitutes who know the high school campus, the students, and the CTE curriculum. The disadvantages are equally obvious. That is, teachers must turn over their classes to substitutes, who can be difficult to procure in California, and the cost is relatively high.

4. *Providing compensation for weekend or summer work.* This mechanism is excellent for generating longer blocks of time. The downside is that it is sporadic and that some teachers will not participate, even when compensated. Obviously, there are also budget implications.

5. *Scheduling common preparation periods.* Although such scheduling can create challenges, a school may benefit significantly from scheduling common preparation periods for teachers within one or two industry sectors or pathways each year on a rotating schedule. And it is a no-cost option.

6. *Restructuring time by permanently altering the school schedule.* This practice has become increasingly common in California. Schools create a block of time each week by lengthening classes by a few minutes four days a week. The additional minutes—gained by moving a 50-minute period to a 55-minute period, for example—are then banked and used for a staff development or teacher collaboration period once a week. With a five-minute increase, the total would be five minutes times six periods per day times four days or 120 minutes—two hours per week for professional development.

   This time is best provided in high school on a late-arrival day, with school starting, for example, at 9:30 a.m. instead of 7:30 a.m. on Tuesday, Wednesday, or Thursday. (Late arrival on Monday or Friday increases absentee rates.) Often, late arrival is preferable to early release (e.g., sending students home at 1:30 p.m. instead of 3:30 p.m.) because teachers are much fresher in the morning and students tend to sleep in. Otherwise, teachers would have to create interesting alternative activities for their students in the afternoon. Although late-arrival days may affect bus schedules, union contracts, and facilities maintenance, it is a no-cost option working well in many school districts.

7. *Making better use of available time and staff.* For example, one of the two teachers that may be in the Food Service and Hospitality pathway might

be released during the other teacher's preparation period for several days to complete a specific task, such as curriculum alignment, with the classes being covered by a substitute for the period. Additionally, technology allows for audio and video conferencing, which saves time and travel if the teachers work at different sites. And online courses can be used to address CTE teachers' mastery of industry content and instructional skills.[17]

Professional development collaboratives. CTE professional development can be significantly enhanced through partnerships with a variety of entities in business and industry, professional organizations, the community, and educational organizations.

- *Business and industry partnerships.* The school or school district arranges for teachers to participate in professional development activities, such as those provided through intersessions or summer paid externships offered by businesses within the teachers' fields. These approaches help CTE teachers stay current in their industry sector and provide the district with cost-effective professional development.
- *Professional organization partnerships.* Other good sources for professional development are educational organizations concerned with sectors of business and industry. For example, the California Industrial and Technology Education Association (CITEA) provides specific standards-based professional development in various venues, such as annual regionalized in-service days, the CITEA annual conference, and annual regional meetings. The California Agriculture Teachers Association (CATA) offers similar services; and other organizations, such as the California Business Education Association (CBEA), provide professional development through their Web sites and annual conferences.
- *Community partnerships.* Many community organizations and businesses offer educational programs or lectures on specific topics. For example, the American Diabetes Association might discuss the diagnosis, prevention, and treatment of diabetes in a Health Occupations classroom presentation; or the Jet Propulsion Laboratories may present an interactive discussion of careers in aviation and aerospace transportation. Schools can schedule a day in which many different organizations offer such information or structure a day centered on a single organization or educational concept. Students receive the benefits of tested programs and information directly from the source, and their teachers receive the benefits of professional development. However, this no-cost option is useful only as an augmentation to the mainstream program.
- *Educational partnerships.* Schools partner with local providers of professional development, including colleges or universities and nonprofit organizations, to provide classes on-site. In this option teachers usually pay for continuing education units or regular college units that count toward the teachers' improved placement on a salary schedule. This approach can address the professional development needs of CTE teachers, such as learning to integrate foundation standards with CTE content and improving instructional skills.

Professional development topics crucial to CTE instruction. Four topics that deserve additional in-depth discussion of professional development, given how critical they are to the successful implementation of standards-based education in CTE, are (1) integration of pathway and foundation standards; (2) integration of instruction and assessment; (3) data-based decision making; and (4) up-to-date industry skills.

1. *Integration of pathway and foundation standards.* Most school districts have some internal professional development capacity or work with their county offices of education on issues like the implementation of standards. However, many are not as well equipped to meet the specific needs of CTE educators as to integrating foundation standards with their CTE courses.

   If providers are not available locally for professional development in integrating foundation and pathway standards, some universities and private providers can do so. For example, Sonoma State University has worked with the California Department of Education to create Focused Approach to Standards and Testing (FAST), a one- or two-day research-based workshop. It is designed specifically to help those teaching other than academic core subjects incorporate fundamental *CAHSEE* English–language arts and mathematics standards into their curriculum. Follow-up activities are also provided for curriculum leaders in the schools. In addition, educational consulting groups offer professional development and coaching in the integration of academic foundation standards with CTE content standards. For example, consultants from the Southern Regional Education Board's High Schools That Work School Improvement Initiative Program assist schools and school districts in this area (http://www.sreb.org/programs/hstw/hstwindex.asp), as does the ETS Pulliam Group. Another good source for professional development in integrating foundation and pathway standards may be educational organizations concerned with business and industry, as mentioned previously.

   A significant study done by the University of Minnesota demonstrated the high value of providing CTE teachers with professional development targeted directly to the academic foundation standards they are asked to incorporate into their pathways.[18] This study and other research over the past decade have proven the causal connection between the depth of teacher preparation in the field and the achievement of students in the classroom. For the most effective integration of CTE and academic topics and the greatest benefit to students, CTE teachers need to be prepared through professional development to provide excellent instruction in both CTE pathway and foundation standards.

   Additionally, the professional development offered in foundation academic standards must be tailored to reflect the interpretation of the district and school. For example, many CTE sector foundation standards include writing strategies and applications standard 1.6 in grades eleven through twelve: "Develop presentations by using clear research questions and creative and critical research strategies. . . . " When the English teachers of a school "unpack" this

standard, they may choose a precise methodology for framing "clear research questions" that they then agree to use throughout the department.

To ensure that student learning is effectively reinforced, CTE teachers must use the same terminology and approach as the English teachers do in addressing this standard. They should be involved in the planning or copresentation of professional development to ensure alignment with the practices of the academic faculty. And, as in all professional development, CTE teachers should be involved in and in control of the focus for the training—in this case, which foundation standards will be reviewed and refreshed.

2. *Integration of instruction and assessment.* Although most CTE teachers have taught and assessed laboratory assignments and performance tasks for years, few have integrated standards with that pattern. The foundation and pathway standards-based assignments and integrated rubric-based assessments discussed in chapters 1 and 2 and exemplified in Part II will likely be new concepts worthy of being scheduled in the professional development calendar.

   Because creating standards-based assignments with rubrics is not an intuitive process, it may require a significant change in the way teachers plan lessons, create assignments, and assess student work. Staff development is absolutely essential to helping teachers make this transition.

3. *Data-based decision making.* To increase CTE course rigor and positive student outcomes, teachers must be able to make data-based decisions. Using rubrics can produce a wealth of information about the mastery of skills by individual students and the level of mastery for the class as a whole. To ensure that all students receive the support they need to be successful, teachers need to make instructional and curricular decisions based on data from student performance. A strong staff development plan can bolster the teachers' skills in this area.

4. *Up-to-date industry skills.* CTE teachers must have opportunities to maintain their industry skills to match current workplace demand and to make the implementation of pathway standards reflect current industry realities. In some industries experiencing extremely rapid change, annual renewal and upgrade of a teacher's skills may be needed.

Component 5. Career Awareness and Guidance

Career development. Career development is integral to comprehensive guidance and counseling programs that help students explore career options and identify educational paths to reach their goals. Required components of ROCP guidelines and counseling are included formally or informally in most CTE programs, especially those in academy structures.

The California Career Resource Network (http://www.californiacareers.info) is a state agency established to provide career information, resources, and training materials to middle school and high school counselors, educators, and admin-

istrators. The California Department of Education works with the California Career Resource Network to expand career development resources and training for career guidance paraprofessionals in the state's educational agencies.

Career guidance. Regardless of the structure of the school or the delivery modes for counseling, career guidance is essential in reinforcing and strengthening the impact of existing CTE instruction and programs. It gives students a picture of the larger context of their studies and the opportunities available to them in the working world.

Effective counselor-led career guidance programs promote awareness of various careers and help students explore options. The guidance activities also promote self-knowledge as students learn about their own interests and aptitudes. And they help students plan for, transition to, and succeed in postsecondary education and training and in their chosen career paths.[19] Counselors have a unique role and a responsibility to provide information and resources to help students build the skills they need to choose, train for, and manage their careers.

To carry out this important task, counselors need CTE-specific training and information to guide all students through appropriate choices and scheduling. They need a deep understanding of CTE course sequencing and integrated two- and four-year programs as well as clarity about CTE programs, industry sectors and pathways, and career options. With these tools they can use industry-sector resources to help students plan their education with a career technical goal in mind. Counselors need to be aware of which CTE courses meet a–g requirements and understand the process for getting CTE courses accredited as a–g (see http://www.ucop.edu/a-gguide/ag/a-g/new_course_cert.html). They must also be able to assess student interests, strengths, and weaknesses and help students identify suitable career areas for study.

School counselors cannot be solely responsible for CTE enrollment and promotion. Teachers and administrators also play crucial roles. In California high schools the average ratio of school counselors to students is 478:1, almost twice as large as that recommended by the American Counseling Association,[20] and students' counseling needs are diverse. Therefore, schools must integrate career guidance with all aspects of students' lives to reach all students effectively. All participants in the education process—parents, faculty, school staff, school district and county office staff, and the students themselves—have important roles in career guidance.

Counselor or adviser information about CTE. School counselors or advisers can be key figures in the advancement of CTE because they have significant influence over course selection for students. They are very familiar with academic course work but seldom with CTE. Furthermore, their ability to counsel students effectively about CTE options may be impeded by some common misconceptions about the relevance and rigor of CTE courses.

In *Major Needs of Career and Technical Education in the Year 2000,* a project of the National Dissemination Center for Career and Technical Education, the image of CTE among students, teachers, counselors, and administrators was cited as a recurring concern.[21] Counselors, particularly, play a key role in scheduling students and advising them on how best to plan for their goals after high

school. When counselors are unaware of CTE benefits, as many are, they may guide students to other educational options, even when CTE may in fact be more appropriate to the students' goals and needs.

Counselors need to increase their understanding of what CTE is and why it is a viable choice for all students. Although preservice education is a logical point at which to address counselors' knowledge of CTE, in-service professional development and other strategies must be used to help counselors understand the important role CTE plays in meeting the overall mission of secondary schooling.

A related need is that counselors understand CTE course sequencing. For example, an inexperienced counselor who might place in a trigonometry class a student who lacked the prerequisite study of geometry may also not be aware that advanced or capstone CTE courses have important foundations in introductory and concentration courses.

The California Department of Education's counseling and guidance guidelines align well with the American School Counselor Association's *National Model for School Counseling Programs,* which provides school counselors and school counseling teams with an outline for designing, coordinating, implementing, managing, and evaluating their programs for student success. It provides a framework for delivery of the ASCA national model student competencies, including guidelines for career development:

1. Students will acquire the skills needed to investigate the world of work in relation to knowledge of self and to make informed career decisions.
2. Students will employ strategies to achieve future career goals with success and satisfaction.
3. Students will understand the relationship between personal qualities, education, training, and the world of work.[22]

These guidelines for the counselor's role and other CTE information need to be provided to school counselors in every possible arena, and CTE stakeholders must make a concerted effort to ensure that this objective is accomplished. School district or county staff can create a think tank or CTE action team to develop approaches to this task and use those approaches to create an action plan for each site.

Ideas for involving school counselors and building their awareness and understanding appear in the following list, partially adapted from a publication issued by the National Dissemination Center for Career and Technical Education:

1. Secure the principal's permission to have a counselor on CTE advisory committees.
2. Invite counselors to CTE department meetings, showcase meetings, and partner meetings.
3. Share with counselors success stories of students in CTE programs and graduates of CTE programs.
4. Include counselors on appropriate e-mail lists or internal mailings.
5. Provide workshops on in-service days and invite counselors.
6. Hold a counselors' meeting featuring student-made materials and student presentations about each course.

7. Hold Counselors' Nights or Administrators' Nights.
8. Ensure that a CTE representative is on all major school committees to advocate for CTE.
9. Respond to calls for presentations from the California Association of School Counselors or write an article for the association's newsletter (http://www.schoolcounselor-ca.org).[23]

Component 6. Student Scheduling

The career development process begins with guidance about selection of courses and programs and career information that can allow students to identify and work toward career goals. CTE is a uniquely powerful and effective tool for career exploration and development that usually requires a program of study over several years. Therefore, counselors must be prepared to guide students through integrated two- and four-year programs and CTE sequences of study as well as through traditional year-by-year academic courses.

In the following examples four-year course programs are shown for students with varying circumstances and goals: (1) students completing a full CTE program and planning to attend a community college or enter the workforce directly; (2) students requiring academic intervention in high school but wanting to complete a full CTE program; and (3) students completing a CTE sequence of courses and a–g requirements.

1. *Students completing a full CTE program.* Students can easily complete a full CTE program and fulfill their high school graduation requirements. The course of study in Example 1 demonstrates a typical pattern for a CTE major:

Example 1: Student who is graduating with a CTE major in business and is planning to attend community college:

Grade 9	Grade 10	Grade 11	Grade 12
English 9	English 10	English 11	English 12
Arts	World History	U.S. History	Government/ Economics
Algebra I	Geometry	Accounting I	Accounting II
Physical Science	Biology	Marketing I	Marketing II
Physical Education	Physical Education	Business Finance	Business Law
Introduction to Business	Computer Applications	Advanced Computer Applications	Virtual Enterprise

2. *Students requiring academic intervention.* An increasing challenge to enrolling students in coherent CTE pathways is what some educators call the "squeezing" out of CTE course work by required academic intervention. As schools fail to improve quickly enough to exit the Immediate Intervention/Underper-

forming Schools Program (II/USP) or keep up with the rising requirements of adequate yearly progress (AYP) under the No Child Left Behind Act, they are required (in the case of II/USP) or urged (in the case of AYP) to enroll lower-achieving students in extra courses of mathematics and reading intervention, particularly in the ninth and tenth grades.

For example, in II/USP schools that do not make the required gains, a School Assessment and Intervention Team (SAIT) helps schools plan for and implement the required state program for intervention, which consists of the following:

a. Three periods of reading per day for students reading two or more years below grade level
b. Two periods of English–language arts for students reading between grade level and 1.9 years below grade level
c. Algebra I and one algebra support class for students underperforming in mathematics by two or more years (*Note:* School districts are allowed to count these two classes as meeting a two-year mathematics requirement.)

With these interventions in place, a student struggling in both reading and mathematics might spend five periods in ninth grade on those two disciplines. Obviously, that amount of time significantly affects the availability of time for CTE and other courses. However, CTE remains feasible in the context of four-year student programs, even for academically challenged students in SAIT schools, as demonstrated in the following sample course schedule, which includes all the state requirements for graduation, typical local requirements (e.g., a fourth year of English), and completion of the intervention requirements.

Example 2: Student who is two years behind in both reading and mathematics takes two years to exit from reading and has a CTE emphasis in the Public Utilities pathway of the Energy and Utilities sector:

Grade 9	Grade 10	Grade 11	Grade 12
Reading	Reading	English 9	English 11
Reading	Reading	English 10	English 12
Reading	Reading	U.S. History	Government/ Economics
Algebra I	Biology	Physical Science	Arts
Algebra I support	World History	Physical Education and Health	Electronic Repair and Maintenance
Physical Education	Technology Core	Basic Electronics	Advanced Electronics

Clearly, CTE courses can become an important part of an intervention student's course work, even when that student must take the maximum intervention possible (see Example 2) or even when the student wants to complete a–g requirements in addition to the intervention, as shown in the following Example 3.

3. *Students completing CTE courses and a–g requirements.* Students who want to complete both a sequence of CTE courses and a–g requirements can do so even if both reading and mathematics intervention courses are required, as shown in Example 3, or while exceeding college entrance requirements, as shown in the following examples 4 and 5. The schedules in examples 3, 4, and 5 all assume a simple six-period day without summer school attendance or other supplemental course work. Students who take advantage of summer school or community college courses or attend a school that offers seven or eight periods can complete significantly more courses than those shown in the examples.

Example 3: Student who is two years behind in both reading and mathematics and exits reading in grade nine, completes the a–g requirements, and completes a sequence of CTE courses in the Child Development pathway of the Education, Child Development, and Family Services sector:

a–g subject areas	UC requirements (in units)	Grade 9	Grade 10	Grade 11	Grade 12
(a) History–Social Science	2		World History	U.S. History	Government (semester)
(b) English	4		English 9 English 10	English 11	English 12
(c) Mathematics	3	Algebra I	Geometry	Algebra II	
(d) Laboratory Science	2		Biology		Chemistry
(e) Language other than English	2			Spanish 1	Spanish 2
(f) Visual and Performing Arts	1			Graphic Arts	
(g) College Preparatory Elective	1				Economics (semester) Developmental Psychology of Children
CTE program courses				Child Development and Parenting	Advanced Child Development
Other requirements		Reading Reading Reading Algebra I support Physical Education	Physical Education and Health		

Example 4: A student who is not required to take reading and mathematics intervention and wants to complete a full CTE course sequence in the Machine and Forming Technology pathway of the Manufacturing and Product Development industry sector in addition to completing the a–g requirements for UC/CSU:

This example reflects the student's completing 17 a–g courses, although only 15 are required, including the following: (a) 2.5, rather than minimum 2; (b) 4; (c) 4, rather than minimum 3; and (d) 3, rather than minimum 2:

a–g subject areas	UC requirements (in units)	Grade 9	Grade 10	Grade 11	Grade 12
(a) History–Social Science	2		World History	U.S. History	Government (semester)
(b) English	4	English 9	English 10	English 11	English 12
(c) Mathematics	3	Algebra I	Geometry	Algebra II	(See below.)
(d) Laboratory Science	2		Biology	Chemistry	Physics
(e) Language other than English	2	Spanish 1	Spanish 2		
(f) Visual and Performing Arts	1	Graphic Design			
(g) College Preparatory Elective	1				Statistics (c/g) Economics (semester)
CTE pathway courses		Technology Core	Machine Shop	Metal Fabrication	Advanced Machine and Tool Technology
Other requirements		Physical Education		Physical Education and Health	CADD

Simultaneous satisfaction of the a–g requirements and CTE pathway courses is made easier if one or more of the pathway courses have been approved by UC as satisfying the a–g requirements. Many CTE courses with strong academic components have recieved a–g approval. Examples include courses in agriculture, engineering, biotechnology, animation, graphic design, and business economics. Some pathways and pathway courses lend themselves easily to CSU/UC a–g approval; others are less appropriate.

Another strategy that can assist in allowing students to take full courses of both a–g and CTE classes is to offer more than six classes per day per year. For example, some schools offer a 4 by 4 block that allows students to complete eight courses per year, adding significantly to a student's ability to meet simultaneous goals.

Example 5: By capitalizing on dual-designation courses (CTE courses that also meet a–g requirements), the CTE agriculture student in the following example meets all a–g requirements and completes high school with a CTE program of 4.5 courses:

This example reflects the student completing 20 a–g courses, far beyond the required 15, including the following: (a) 2.5, rather than the minimum 2; (b) 4; (c) 4, rather than the minimum 3; (d) 3, rather than the minimum 2; (e) 3, rather than the minimum 2; (f) 2, rather than the minimum 1; and (g) 1.5, rather than the minimum 1.

a–g subject areas	UC require-ments (in units)	Grade 9	Grade 10	Grade 11	Grade 12
(a) History–Social Science	2		World History	U.S. History	Government (semester)
(b) English	4	English 9	English 10	English 11	English 12
(c) Mathematics	3	Algebra I	Geometry	Algebra II	(See below.)
(d) Laboratory Science	2		(See below.)	Chemistry	Anatomy and Physiology
(e) Language other than English	2	Spanish 1	Spanish 2	Spanish 3	
(f) Visual and Performing Arts	1	Painting			Advanced Painting
(g) College Preparatory Elective	1				Statistics (c/g)
CTE pathway courses		Introduction to Agriculture	Agricultural Biology (d)	Animal and Plant Physiology (g)	Agricultural Economics (g)(semester) Veterinary Technician
Other requirements		Physical Education	Physical Education and Health		

Component 7. Student Recruitment and Enrollment

Research clearly demonstrates the inherent value of CTE for students regardless of their postsecondary plans. Schools, too, benefit from CTE enrollment, particularly as to their at-risk students, who thrive on added motivation and hands-on learning and often credit CTE courses and teachers for motivating them to graduate.

The link between a workforce trained in applied, practical problem solving and increased productivity for employers is well established. And the preceding discussion clearly indicates that virtually every student's schedule can accommodate a sequence of CTE course work. Given these significant advantages to multiple stakeholders, one might assume that every student would be enrolled in and completing full CTE pathways.

The major challenge to maintaining full, coherent CTE pathways continues to be enrollment. General misconceptions that all students should go to a four-year college, that CTE does not prepare students for success in postsecondary education and training, and that CTE preparation is not enough to ensure good career options must be challenged vigorously. CTE is addressing these issues internally by increasing course rigor through an intense focus on both the pathway and foundation standards. But it is also essential to tell parents and students that CTE offers a valid, substantial path to success.

Disseminating CTE information. Part of the school's CTE recruitment planning should address the variety of sources of CTE information. For enrollment to grow while universal access to CTE opportunities is being maintained, students and parents must first be made aware of CTE programs, sequences, and courses; opportunities for postsecondary articulation; employment potential; and services, including referrals. Doing so will require publishing the information in languages appropriate to the school and in a variety of venues (e.g., posted on the Web site, published in brochures, provided on tape or CD for nonliterate families, sent as an enclosure with the annual course selection letter).

In some California high schools, CTE has done an excellent job of marketing its courses by using such strategies as the following:

1. Operating middle school feeder classes
2. Having CTE students present information about CTE programs in eighth-grade classes
3. Holding or participating in CTE-focused summer camps, such as Health Occupations-related day camps
4. Including a CTE teacher presentation in the meeting held by high school counselors for parents of eighth-grade students
5. Having current CTE students create a marketing video used in various venues
6. Conducting after-school programs that highlight CTE
7. Presenting highly visible CTE students' displays or activities at school events
8. Having students distribute student-made brochures, serve as tour guides for CTE facilities, and staff well-marked information tables during such events as eighth-grade visitation day, eighth-grade CTE Activity Night, Back-to-School, and College/Career Night
9. Mailing flyers to all incoming ninth-grade students and their families
10. Conducting pathway planning for all current students prior to registration
11. Having counselors train CTE students to assist with eighth-grade orientation and registration
12. Inviting business and industry representatives to parent nights
13. Keeping the full faculty and staff apprised of CTE program data

These strategies need to be reviewed at the school site, adjusted and augmented to meet local needs, and formulated into a comprehensive marketing plan for CTE. This task is best assumed by CTE teachers and the counseling department, with the full approval of site administrators.

In addition to counselors, parents, and students at the high school, another key target for information and education is middle school staff. The more information and orientation they have about the available courses and programs, the more they can convey to eighth-grade students and their families.

Impacted programs. Opposite to the enrollment issues described previously is overenrollment, producing impacted programs. Often, this situation occurs when a particularly popular course can be offered in only a limited number of sections because staffing or facilities are lacking. If programs are oversubscribed, with more students wanting to enroll than there are slots available, schools must develop an equitable method of student selection. Some magnet schools and career academies have established minimum requirements (e.g., a 3.0 grade-point average and a designation of *proficient* on the *CST* Algebra I examination) to limit student applications. A more equitable solution is to advise students of the rigor of the CTE program, allow all interested students to apply, use a lottery for selection, and establish a waiting list. Those on the waiting list would be admitted as slots become available.

Conclusion

To be recognized as fulfilling half of the high school mandate in California, CTE must be a visible and vital part of the school's central planning efforts—as part of the single-site plan or the WASC plan or as a stand-alone but equally validated plan. The plan must address a variety of issues related to the infrastructure of the school, including financial support for CTE, internal and external review of CTE programs, and a substantial professional development program.

Perhaps most important is the planning directly related to student awareness and understanding of career preparation. Career awareness and guidance programs are essential for the school to meet California's requirement to prepare students for the workplace. Universal access and well-informed counseling—accompanied by a well-designed recruitment and marketing plan—will help all students recognize and benefit from the value of CTE.

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Chapter 4

Community Involvement and Collaboration

Local stakeholders play important roles in creating and maintaining a rigorous, thriving career technical education (CTE) program. They take part in decision making through advisory groups, councils, curriculum and articulation committees, and other boards; participate in career technical student organizations (CTSOs) and CTE booster clubs; attend CTE-related events; and generally participate across a spectrum of CTE activities. This chapter addresses some ways in which educational and community partners can be directly involved in the decision making, operations, and evaluation and improvement involving CTE programs. It also discusses articulation and the alignment of courses.

Partnerships, which are essential to CTE, speak to the very core of learning by doing and work-based learning. CTE thrives when educational and community partnerships help school districts and schools provide comprehensive professional development, work-based learning, and career guidance.

The Role of Educational Partners

School districts, schools and site administrators, counselors, teachers, and technical support personnel are essential to CTE program success, as are parents, guardians, and families and the students themselves. Partnerships with advisory committees, county offices of education, postsecondary education, workforce investment boards, youth councils, apprenticeship programs, regional occupational centers and programs, and adult education programs can also enrich, enhance, and provide relevant context for vibrant CTE instruction.

School districts. School districts are responsible for coordinating and administering CTE by creating policies supporting statewide goals and standards, national laws and directives, and local business and industry needs. They also provide information, resources, and assistance to individual schools.

In medium-sized and large school districts, school boards and administrators view CTE as part of the big picture, using various middle school and high school sites to provide a comprehensive CTE program for an entire district. The districts may choose to establish industry-sector magnet schools, place career academies at specific sites, or locate CTE concentration areas at different schools.

Working with the schools, the districts set program goals and outcomes, coordinate and monitor school compliance, and evaluate and analyze the results of CTE programs. They report the results to schools, parents, the state government,

and other involved or interested parties. Exercising their comprehensive oversight, they also resolve disagreements between sites on CTE policies, requirements, course distribution, and other issues. Another key role for districts is resource allocation and generation, as discussed in Chapter 3. Some districts have also developed excellent relationships with local business and industry that provide multiple valuable resources to be carefully allocated to the school sites to generate a comprehensive, districtwide CTE program and equitable opportunity for students at each site.

Schools and site administrators. As direct providers of CTE, schools are responsible for implementation, administration, and monitoring. They implement district policies and transform them into local programs through the single site plan or other planning documents and are responsible for providing structure and support for CTE programs and classes and staff.

At the local level schools monitor the compliance of teachers and departments, evaluate outcomes, and report that information to a wide audience through the annual *School Accountability Report Card (SARC)* as required by California *Education Code* Section 33126(b)(14). The *SARC* provides data on enrollment, concentration, and completion for all CTE programs and classes, including academic and skills achievement. It also provides the following information:

1. Programs and classes offered by the school that are specifically focused on career preparation and/or preparation for work
2. The methods used to integrate these programs and classes with academic courses and support academic achievement (e.g., courses that have been revised to incorporate CTE foundation standards, courses that satisfy the district's graduation requirements, and courses that satisfy the a–g entrance requirements for UC/CSU)
3. The methods used to address the needs of all students in career preparation and/or preparation for work, including needs unique to defined special populations of students (e.g., steps to ensure equitable access, counseling and guidance, professional development, additional support services, coordination with youth development and economic development organizations)
4. Measurable outcomes for these programs and classes and the ways in which they are evaluated for effectiveness in attaining those outcomes (e.g., mastery of "employment readiness standards; results of career technical skills assessments; business, labor, and other community stakeholder support; participation in CTSOs; and placement of program completers in employment, postsecondary education, or the military").[1]

Adequate financing for CTE is also controlled to a considerable extent at the school site. Local business and industry frequently generate resources for CTE programs at specific schools. For example, in the agriculture sector, the Kingsburg Ag Booster Club provided funding and labor to rebuild the school farm. At Santa Ynez Valley High, a local automobile dealer split a three-year lease on a pickup truck with the agriculture department. West Valley and Anderson high schools have been given resources from the McConnell Foundation in the north-

ern Sacramento Valley to provide school farms and equipment. And agriculture booster clubs throughout the state raise funds for student leadership activities, equipment, and labor.

Often, site administrators and faculty have significant flexibility in creating a CTE structure that works best for their students, including instituting career pathways, career academies, Tech Prep programs, or similar structural elements. With the permission of the district, schools may apply for funding to support their design, such as state grants for California Partnership Academies or federal funding for a smaller learning communities design which includes a career pathway and academy program.

Counselors. The role of guidance counselors is fundamental to the success of CTE programs. Chapter 3 addresses their role and the many ways in which CTE faculty can assist counselors in encouraging *all* students to participate in CTE for successful transition into the workforce and postsecondary training and education.

Teachers. Teachers provide CTE classroom and laboratory instruction and work-based learning oversight according to the policies and curriculum established by the school and district. As the direct providers of frontline instruction, teachers master subject-area content, educational theory and practice, and CTE standards. Through preservice training and ongoing professional development, they also build skills to communicate that knowledge effectively to students. (Strategies for planning and delivering effective professional development for CTE teachers are discussed in Chapter 3.)

Teachers plan and organize instruction to ensure that *all* students master the material and meet the chosen CTE pathway and foundation standards for each course. They set clear, challenging goals for their students and create short-, mid-, and long-range plans that address student needs. These goals and plans reflect school and district CTE policies, goals, and targets and align with the standards. Regularly, teachers communicate their instructional goals and plans to their students, including evaluations of how well the students are achieving the targets. Because evaluation of achievement related to targets is inherent in standards-based instruction, teachers (1) provide their students with frequent one-on-one and classroom-level assessment and feedback on their progress in mastering the key CTE foundation and pathway standards; and (2) communicate the results of the evaluations to the students, their families, and the school. These assessments also benefit teachers, becoming the basis for modifying the instructional plan and providing an ongoing source of professional feedback on instructional methodology. Using the results of these standards-based assessments, teachers can pinpoint students in need of learning support and offer the necessary resources, as discussed in Chapter 2.

To enhance and reinforce learning and motivation, teachers should make use of all available resources. Specifically, instructional plans should incorporate technology and multimedia, libraries and library science, and local business and industry resources wherever possible. Further, CTE teachers have a significant role in bringing together local business and industry resources and the students'

school experience through the various forms of work experience (e.g., internship, community classroom, extended job shadowing, and formal work experience) and career technical student organizations, such as FFA, FHA-HERO, DECA, SkillsUSA, HOSA, FBLA, and TSA. (See the discussion in Chapter 1.)

Teachers are responsible for educating *all* students and creating an effective environment for learning. To achieve that goal, they should respect and foster diversity and promote equity in their classrooms, taking a primary role in encouraging all students to maximize their potential. Perhaps most important, teachers are responsible for the education of today's youths and for the future of CTE. CTE teachers work with the high school faculty as a whole, often leading school improvement efforts, such as the Western Association of Schools and Colleges (WASC) accreditation process and the development of teaching partnerships and assessment models to improve education and student outcomes at the school, district, and state levels.

Technical support personnel. Technical support personnel provide valuable services to CTE staff and programs. These technicians operate career centers in many high schools, providing a focal point for career awareness and exploration activities and may also support tenth-grade counseling activities. (See Chapter 5.)

Internship coordinators are most often found at magnet schools or charter schools that have a CTE focus or at high schools that offer internships through various academies or career pathways. The coordinators help students find potential internship placements and prepare the students for interviews, network with local businesses, make appropriate matches, train business supervisors, train students in job basics, and monitor the internships. They also serve as valuable ambassadors for CTE programs in the community. Frequently, CTE teachers serve as internship coordinators for their students.

Computer technology and network technicians maintain the infrastructure for technology-dependent CTE courses. In many schools they hold full-time positions. And in CTE-focused magnet or charter schools, it is not unusual to find a ratio of one computer technician to every 200 students when each student has a computer and the entire school is networked. For other schools this ratio is simply a dream, and the CTE teacher may be the sole technology support for the school.

Work experience coordinators provide technical support for students in general work experience education. Usually, the coordinators are teachers because the law requires instructional support for work experience students. However, some larger districts maintain both coordinators (who are often classified employees) and supervising teachers in these programs. The coordinators are charged with ensuring that appropriate contracts and learning plans are executed, workers' compensation is in place as required by the program, permits are legally applied for and maintained, and student attendance at the instructional workshops and seminars is consistent.

Parents, guardians, and families. Parents, guardians, and families provide educational support and advocacy for students enrolled in CTE course work. They evaluate the needs of the students, communicate this information to teachers and

the school, and work with teachers to ensure that the individual's needs are met. They also monitor the progress and process of the students' work, supporting, motivating, and encouraging them.

To perform these critical functions, families must be provided with information from the CTE teachers and school administrators. This information can easily be provided in an introductory letter that explains the course content, the standards-based approach to instruction, the type of assessments students will be given, the part families can play in helping the students become successful, and an explanation of how to contact the teacher, the department chair, the appropriate counselor, the career center, and the principal. Sometimes, schools mail the letter to the family home, with translations for non-English-speaking parents. Parents and families respond productively and appropriately to the information they receive and work with teachers and the school to provide support.

Finally, parents, guardians, and families show their commitment to and investment in education by working to improve and support the CTE classroom and career-related student organizations through groups such as booster clubs and parent-teacher-student associations. It may be helpful in developing leadership to have students request that support directly. For example, parents may be contacted directly by the officers of a career and technical student organization (CTSO) to run food booths for an upcoming competition they are hosting in the region.

Students. The students' role in their CTE program consists of taking responsibility, making an effort, and demonstrating respect. With assistance from the CTE instructor, students can identify and develop short-range, mid-range, and long-range goals in their career pathway. They can then plan the courses they will take and the on-the-job training they will complete to reach those goals. Students then work to complete the plan and meet their goals by:

1. Contributing the effort, time, interest, and energy necessary to learn. This "buy-in" is required for success in any educational venture and is particularly crucial in CTE, where hands-on work mandates understanding of and attention to detail (CTE foundation standard 7.0, Responsibility and Flexibility).
2. Monitoring their progress toward their goals. Monitoring can take place in the CTE classroom, in an advisory structure, or in regular meetings with the counselor. Some schools have student-led conferences in which the students review their work with their parents and update them on their progress in relation to their plan (CTE foundation standard 5.0, Problem Solving and Critical Thinking).
3. Soliciting and responding appropriately to feedback from teachers, mentors, peers, their families, and work supervisors. Again, this strategy works best if the process is structured by the CTE teacher. Students must be taught how to solicit feedback on their work and progress and how to respond appropriately to both positive and negative feedback. This strategy can be accomplished in the classroom through peer review, in student organizations and through student-led conferences, and through training for internships, work experience,

apprenticeships, or other work-based experiences (CTE foundation standard 5.0, Problem Solving and Critical Thinking).
4. Modifying or improving their habits and learning behaviors for success. Structure to accomplish this goal can be provided in the CTE classroom by a focus on learning behaviors and attitudes that are most successful (CTE foundation standards 5.0, Problem Solving and Critical Thinking; and 7.0, Responsibility and Flexibility).
5. Improving their educational experience by seeking and mastering new challenges, expanding their abilities, and adding skills and knowledge to their learning portfolio. Creating short-, medium-, and long-range plans helps students recognize the value of taking on rigorous challenges that will expand their skills and knowledge. The CTE structure will help them become successful in their efforts (CTE foundation standards 3.0, Career Planning and Management; and 7.0, Responsibility and Flexibility).

CTSOs provide excellent venues for students to develop leadership skills. They are designated as intracurricular by the U.S. Department of Education because of their importance in delivering key skills for career success. Often, they provide the only opportunity a student has to travel outside the local area, meet and make friends from all over the nation, visit colleges, make connections with business leaders throughout the state, hone and practice interpersonal skills, and participate in the legislative process.

Advisory committees. Usually, advisory committees consist of groups of employers and community representatives who advise the school on the design, development, operation, evaluation, and adjustment of CTE programs.[2] This external influence ensures that CTE courses meet current and future workforce needs. The committees are indispensable in maintaining state-of-the-art, community-linked curricula provided they carry out their stated functions rather than have only a pro forma existence on paper.[3] When educators maximize the potential of advisory committees, those committees are advisory in the best sense of the term (i.e., they offer their expertise and assistance but do not assume administrative authority).

In California certain CTE advisory committees are required by law or are institutionalized in practice. Although these separate provisions sometimes specify all or part of a committee's makeup, it is generally accepted as good practice to include members from business and industry, education, state employment and workforce agencies, public and private agencies, and the community. Parents and students should also be included. The most common CTE advisory committees are those required by law as follows:

1. Regional career guidance centers (California *Education Code* Section 52343). A local advisory committee is composed of 11 members, at least seven of whom are from business, industry, labor, and the general public.
2. ROCPs (California *Education Code* Section 52302.2). Subject area advisory committees determine courses appropriate for regional occupational centers or programs and provide advice.

3. Unified school districts and union high school districts with a CTE program (California *Education Code* Section 8070). A career technical education advisory committee develops recommendations on the program and provides a liaison between the district and potential employers.
4. Unified school districts and union high school districts with a partnership academy (California *Education Code* Section 54692[a]). An advisory committee consists of those involved in academy operations, including school district and school administrators, lead teachers, and private-sector representatives.
5. Unified school districts and union high school districts, ROCPs, and county offices of education receiving Carl D. Perkins funding (Public Law 109-270,Section 134[b][5]). Advisory groups involve parents, students, teachers, representatives of business and industry and labor, representatives of special populations, and others involved in Perkins-funded CTE programs.[4]

An effective advisory committee develops and implements an annual action plan that reflects long-term and short-term objectives. The most effective groups provide a wide variety of support to CTE programs, including the following:

1. Curriculum development, assisting programs in:
   a. Analyzing course content, materials, and sequences to establish performance benchmarks and align them with competencies and tasks
   b. Identifying and expanding the use of new technologies
   c. Assisting in developing and validating performance tasks and other tests
   d. Advising on labor market trends
   e. Recommending safety policies and procedures
2. Program evaluation, helping programs by:
   a. Reviewing goals and objectives in relation to outcomes
   b. Comparing student performance standards with business and industry standards
   c. Evaluating facilities, equipment, and technology to recommend upgrades
   d. Recommending initiation of new programs or elimination of obsolete programs
3. Community and public relations, assisting programs by:
   a. Creating a marketing plan cooperatively
   b. Recognizing outstanding students, teachers, and community leaders
   c. Generating effective media coverage
   d. Presenting programs to community groups
4. Recruitment and job placement, helping CTE programs by:
   a. Recruiting potential students
   b. Identifying job openings
   c. Placing students in cooperative work experience, internships, or other work-based learning opportunities
   d. Hiring graduates
5. Student organizations, supporting programs by:
   a. Sponsoring student organization activities and assisting in fund-raising

   b. Assisting in developing and judging competitive skill events
   c. Establishing scholarships and awards
   d. Implementing leadership development activities
6. Professional development, augmenting school efforts through teacher recruitment and:
   a. Reviewing teacher selection criteria and recruiting potential staff
   b. Providing in-service activities for instructors
   c. Offering teachers internships or externships and summer opportunities for improving skills
   d. Encouraging personal initiative
   e. Reviewing professional development plans
   f. Supporting financially teachers' attendance at professional meetings and conferences
7. Resources, augmenting programs by:
   a. Providing financial support, equipment and materials, tours and field trips, job-shadowing opportunities, and classroom speakers
   b. Assisting in budget development and review
   c. Brokering cost-saving arrangements with other organizations in business and industry
8. Legislation and advocacy, assisting specific programs and CTE in general by:
   a. Staying current on state and federal legislation
   b. Advocating for CTE programs
   c. Arranging tours of programs
   d. Involving policymakers in program events[5]

County offices of education. California's 58 county offices of education play a major role in supporting the delivery of CTE to school districts and schools in their areas. From coordinating ROCPs to providing professional development and enrichment opportunities for teachers, county offices of education are important CTE resources for all schools and districts.

The county link with ROCP allows for centralized development of a CTE program that is available to a large number of students and appropriate to the needs of the community. Particularly in areas with smaller schools that might be unable to develop and maintain their own CTE programs, county-level ROCP programs are one of the driving influences in secondary CTE programs. For example, the Glenn County ROCP offers numerous popular CTE courses in agriculture, computer repair and maintenance, furniture and cabinet construction, health occupations, hospitality occupations, registered dental assisting, sports therapy, and virtual enterprise to over 1,400 high school and adult learners from five rural high school districts.

Postsecondary education. Universities, colleges, community colleges, and technical training schools prepare CTE students for skill- and knowledge-intensive careers and offer credential preparation for CTE teachers. They also serve early on to determine prerequisites and qualifications for advanced study for careers by setting requirements for matriculation and graduation.

Increasingly, community colleges have become the public sector's focal point for higher-level CTE. This role of the community college supports high schools that build continuous career pathways with rigorous CTE courses that deliver both foundation and pathway standards. These collaborative partnerships can result in highly articulated formal or informal programs leading to certification, an AA degree, or transfer to a four-year institution.

High schools with limited CTE resources can augment their programs with community college classes. A number of discretionary grants to postsecondary institutions require articulation with high schools, creating an opportunity for additional funding and an incentive for partnerships. This possibility should be considered in developing a comprehensive CTE plan.

Workforce investment boards. The Workforce Investment Act (WIA), implemented through local, broad-based workforce investment boards (WIBs), is the primary federal source of job-training funding in California and includes youth programs through WIA's Title I.[6] These programs are targeted to disadvantaged youths fourteen years of age and older and include work preparation, education, and work-based learning experiences. Local one-stop career centers link youths to the programs. Schools can work with the center providers to implement work-based learning opportunities for most students with disabilities and the economically disadvantaged. For example, the centers might provide support and funding for paid internships for economically disadvantaged students.

Each WIB has a youth council that works with local elected officials, business leaders, unions, community-based organizations, foundations, and local educational agencies to promote youth workforce preparation. Youth councils also build leadership skills for council members. Statewide, youth councils support an approach called All Youth, One System to address the interrelated academic, career, and developmental needs of young people.

Apprenticeship programs. In California apprenticeship programs prepare an individual for a career in skilled crafts and trades. There are more than 800 apprenticeship careers in the United States and more than 200 in California.[7] The apprenticeship training system is unique in that its basic foundation is a partnership between industry, labor, education, and government. Business-, industry-, and union-driven, the apprenticeship training system provides an effective balance between on-the-job training and theoretical instruction.

The California Department of Education supports related and supplementary instruction (RSI), the classroom aspect of an apprenticeship, in local adult education and ROCP agencies for over 200 apprenticeship programs. These programs enroll more than 30,000 registered apprentices, 43 percent of the more than 69,000 registered apprentices in California.[8] Apprenticeship programs are developed and conducted by individual employers, employer committees, or jointly sponsored labor and management associations and guarantee the fair selection, employment, and training of apprentices. Sponsor employers evaluate work-site conditions, identify skilled workers to serve as trainers, and schedule a rotation of training. Local ROCPs and adult schools provide the RSI and contract with program sponsors.

Apprenticeship programs typically span a period of three to five years. Registered apprentices attend a minimum of 144 hours of RSI directly related to on-the-job experiences. When an apprentice has completed an entire program of on-the-job training and RSI, the sponsor recommends that the State Division of Apprenticeship Standards issue a certificate of completion of apprenticeship, thereby granting the apprentice journeyman status.[9]

Adult education. Adult education programs offered through school districts can provide high school students who are short of meeting graduation requirements with additional opportunities to earn course credit in academics and CTE and to prepare for the *CAHSEE* or *GED.* Typically, adult education classes are held during the normal school day, in the late afternoon or evening, and often on Saturdays. Additionally, some adult schools offer online courses.

The Role of Community Partners

Community partners, including business and industry, labor, community organizations, youth development organizations, government, and the military are a significant source of help for CTE programs:

Business and industry. As the current and future employers of CTE graduates, business and industry are substantial stakeholders in the CTE process. To ensure the quality of their future workforce, businesses collaborate with CTE teachers at the site or district level to create formal or informal strategic plans, much like those developed for ROCP. They begin this process by evaluating and identifying the following:

1. Number of CTE graduates and rates of graduation at the high school and community college levels
2. Current industry needs for trained employees, by industry sector
3. Projected employment needs, including staffing levels and specific areas of knowledge and skills
4. Methods to close the gap between projected needs and supply sources
5. Resources needed to address the gap.

This fundamental planning forms the basis of business-education partnerships. By partnering with individual schools or districts, businesses can influence the development of industry-appropriate CTE educational goals. The partnership plan includes work with teachers, schools, and school districts to create innovative and effective strategies to ensure that future business and industry needs are met. As part of this partnership, local businesses may provide student benefits and incentives, educational and professional opportunities, and financial support.

Business and industry also participate in CTE through involvement in many of the strategies discussed previously, including work-based learning agreements, externship programs for teachers, various planning councils and panels related to CTE, and a variety of other activities. Many leaders in business and industry are eager to be involved, and educators should welcome them into the CTE community to forge strong, lasting relationships.

Labor. Unions and other organized labor groups contribute significantly to the success of CTE in California. As discussed previously, unions play a key role in the state's apprenticeship system. Labor representatives are also among the members of the workforce investment board, as required by legislation, and frequently serve on the associated youth councils.

As with business and industry, labor's major contribution to CTE for K–12 is through assistance with CTE's planning and program improvement efforts at the school or district level. Labor representatives are in a unique position to provide ideas for assessments that mimic the workplace. They can also provide valuable support to struggling students through mentoring and/or tutoring programs. And they can support CTSOs by providing advice, resources, and time.

Labor representatives also have a significant role to play as to foundation standards common to all industry clusters, such as the following:

3.4 Understand the role and function of professional organizations, industry associations, and organized labor in a productive society.
6.1 Know policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities.
7.3 Understand the need to adapt to varied roles and responsibilities.

Community organizations. Community organizations have a history of supporting CTE, including the following:

1. *Libraries, nonprofit organizations, and city and county programs* that provide education support, including access to specialty information and education-related services
2. *Professional and trade organizations,* including associations and interest groups, that provide access to current professionals in the field, up-to-date content information, and feedback on the appropriateness and applicability of CTE course offerings
3. *Alumni organizations* for school or CTSO members providing learning support and networking for students, including access to professional and peer mentors
4. *Social and health services organizations* that offer support to students struggling with problems that affect their academic and CTE performance (Because of the mentoring role taken on by many CTE instructors, it is helpful to build relationships with these organizations for referral of students in need.)

Youth development organizations. Other potential CTE partners are youth development organizations, such as the YMCA, YWCA, Boys' and Girls' Clubs, and 4-H. For industries that do not have established CTSOs, these organizations can provide students with a venue for building leadership skills, honing CTE skills through competition, or sharing CTE skills with peers or younger children.

Government. The role of government in CTE is one of policymaking and, in some cases, financial support. Federal and state governments create educational policies and directives that guide education through legislation, statewide initiatives, and such programs as those supported by the Carl D. Perkins Career and

Technical Education Act of 2006. In addition, federal and state governments set general policies that affect employment and economic conditions, which in turn affect the entire workforce, including students.

Local governments may highlight or emphasize certain aspects of CTE through directed funding programs and population- and locality-specific policies. In addition, they can act in response to expressed needs within their constituencies, including those of area businesses and industries. Local governments are particularly involved with job-training initiatives that include a variety of training opportunities for high school students, such as those overseen by the workforce investment boards.

Military. The military offers extensive postsecondary job training and education programs tied to military service. It has access to high school students' personal contact information (unless parents request otherwise) through the No Child Left Behind Act. Most students will be contacted at home as well as at school, and recruiters will provide full information about offerings.

The military's free *Armed Services Vocational Aptitude Battery (ASVAB)* Career Exploration Program (http://www.asvabprogram.com) is intended for students in the tenth, eleventh, and twelfth grades and in postsecondary programs. It provides tools, including the test battery and interest inventory, developed by the U.S. Department of Defense to help high school and postsecondary students learn more about career exploration and planning. Results of the aptitude test and the interest inventory enable students to evaluate their skills, estimate their performance in academic and career endeavors, and identify potentially satisfying careers. These results are integrated with work values to help students identify and prioritize possible career choices. Students are encouraged to consider their own work-related values and other important personal preferences as they learn career-exploration skills that will reap lifelong benefits.

Junior Reserve Officers Training Corps (JROTC) programs, representing the various military branches operating on many high school campuses in California, are usually elective courses that may be taken each year (e.g., JROTC Leadership Training I–IV). Typically, student cadets are introduced to CTE foundation standards and essential skills, such as leadership, ethics, citizenship, communication techniques, physical fitness, and military readiness, through a combination of classroom instruction and extracurricular activities. (*Note:* JROTC student cadets are under no obligation to join the military.)

Articulation and Alignment of Courses

Articulation and alignment of courses are the backbone of effective, coherent CTE pathways. All districts face articulation issues at the high school to postsecondary transition point, and many have difficulties with middle school to high school alignment within a single district. These problems are exacerbated for high school districts. For CTE courses to be articulated effectively, both parties involved must be satisfied that all courses are rigorous, prepare students adequately for the next step, and fulfill the requirements for the type of credit desired. To reach this state of agreement, schools may find the following steps helpful:

Development of an articulation team. The first step in successful articulation involves the formation of an articulation team, including key individuals (e.g., teachers, administrators, counselors). For efficiency one person should be designated to coordinate and monitor the articulation process. Before beginning to examine course content, the articulation team will need to:

1. Establish goals to be achieved through articulation.
2. Ensure "buy-in" from relevant administrators, teachers, and support staff not directly involved in the articulation process.
3. Develop or clarify existing policies and procedures for articulation, including a guidebook or other materials for counselors and teachers.
4. Decide which programs are to be articulated (preferably programs that already exist at both institutions and for which there are detailed, standards-based competencies already developed).
5. Conduct staff development on articulation for involved faculty at all institutions if necessary.

Review of course content. Once a clear set of policies and procedures has been created and the key stakeholders are committed to the articulation goals, course content is reviewed. Middle schools and high schools now share common standards for CTE instruction, but community colleges and other postsecondary schools may be working from industry standards that will need to be cross-referenced with the *California Career Technical Education Model Curriculum Standards.*[10] Some industry sectors have created these cross-references independently. The procedures to be followed are to:

1. Identify the specific courses within the programs to be articulated.
2. Identify the standards taught in those courses. For courses that do not use California's CTE standards, cross-references will need to be developed or identified between the standards being used by different teachers or institutions.

Determination of advanced credit. Courses may be aligned to provide advanced placement, single credit, or dual credit. Advanced placement allows students completing a course at one level to have a similar course waived at the next level. For example, a student who has completed Introduction to Health Science at the middle school would be allowed to pass over the equivalent course at the high school and move directly into appropriate concentration courses. However, high school credit would not be awarded for completion of the introductory course. When a student takes a higher-level course but gets credit only at the higher level, the student is awarded a single credit. An example would be that of a student who takes a college course in a CTE pathway and gets college credit only. Dual credit provides students with credit at the institution providing the course instruction and at a second institution. For example, a student who completes Welding I or Equine Science at a community college might receive both college and high school credit for the course.

Once the type of advanced credit is identified, the articulation team must:

1. Identify the standards taught in the courses.

2. Identify the means used to evaluate student mastery of the standards.
3. Revise the curricula so that both levels have identical, similar, or overlapping standards and requirements depending on the type of credit desired.

Formalizing the decision. Once the courses have been aligned to the satisfaction of the articulation team, a formal agreement should be written, including the criteria for articulation credit (e.g., postgraduation time limits, acceptable achievement levels). The agreement should then be reviewed, approved, and signed by the relevant personnel or governing boards at each of the participating institutions, with copies provided to all participants, such as site administrators, school-level CTE advisory councils, and ROCPs.

Review and revision. Articulation agreements are ongoing and should be reviewed regularly. Because it can be difficult to sustain the regular collaboration and contact required to schedule and conduct such reviews, one person on the articulation team should be designated to manage this aspect of the process and carry out responsibilities, such as the following:

1. *Public relations and communications.* Let counselors, teachers, parents, students, and employers know about the articulation agreement through mailings, meetings, informational materials, advertising, and local press releases.
2. *Data collection.* Develop and implement ways to track program success, specifically how student performance, satisfaction, and enrollment patterns are changing for the articulated courses. If other similar programs have not yet been articulated, they may serve as a control group for these data. Otherwise, historical performance or enrollment data can be used to show change over time.
3. *Review.* The data on program success and the articulation agreement itself should be reviewed by the articulation team at least annually. This review should be initiated and managed by the designated coordinator.
4. *Revision.* The articulation agreement should be revised as necessary in accord with the annual review by the articulation team and submitted for approval and information as appropriate.

If these steps have been followed, course articulation will remain strong, relevant, accurate, and dynamic.

Articulation strategies by level. Strategies for effective articulation vary somewhat by educational level and by district configuration.

Elementary school and middle school alignment. CTE is perhaps the truest form of lifelong learning. From elementary school through formal training and multiple work sites, Americans are constantly developing and improving the knowledge and skills needed for success. Students have their first opportunities to explore careers in elementary school through listening to classroom speakers and participating in projects, field trips, and other organized activities.

Middle school and high school articulation. In middle school many students engage in career exploration through such activities as completing career interest and aptitude tests, participating in job shadowing, or writing "I Search" papers about a career. They may also take exploratory or foundation courses to prepare

for high school CTE. Where middle school CTE efforts have been articulated with high school programs, students can begin cohesive, age-appropriate career preparation programs as early as the sixth or seventh grade.

CTE high school programs articulated with middle school programs are highly advantageous for three reasons. First, because high schools have built-in CTE feeder systems, recruitment is easier. If the middle school uses a sampler or "wheel" approach to CTE, the arts, and foreign languages, all students are exposed to some level of CTE programming and are thus more aware of the variety of course offerings in high school.

Second, high school programs benefiting from rigorous introductory courses offered at the middle school level can decrease the number of introductory sections and use their resources to expand concentration and capstone or advanced course work. This situation is similar to that in the mathematics department, where fewer Algebra I sections are needed because the course is increasingly being taught at the eighth-grade level.

Third, the educational theory behind middle school exploration is to allow students to sample work in a particular industry. Thus, students might try several different pathways and choose the one they like best to pursue at the high school level. Or they may use their middle school experience to determine that they are not interested in any of the sectors or pathways they tried. Regardless, they will enter high school more focused than will students who have had no middle school experience. Therefore, they will have a better chance to complete an entire CTE program—and possibly even a college course or two in Tech Prep—during their high school years.

High school to postsecondary training and education alignment. The most common alignment of high school and postsecondary curricula occurs through Tech Prep 2+2 programming. Tech Prep programs with integrated and articulated curricular pathways result in well-prepared high school students earning advanced technical degrees and certification at a community college. These pathways, which are academically rigorous, provide students not only with the fundamental skills required for postsecondary admission but with also the technical skills enabling them to have successful careers in the state's new, highly technical economy.

California's Tech Prep delivery system has a state administration and leadership component as well as the Tech Prep local consortia. Both focus on emerging and high-demand technical careers to ensure the following:

1. Linkage of programs with the local, state, and regional economies
2. Collaboration and systematic articulation of programs between high schools and community colleges
3. Development of comprehensive strategies between multiple state and federal programs to encourage joint planning and avoid unnecessary duplication of service delivery
4. Funding and programmatic decisions directed toward industry priorities
5. Focus on accountability and an infrastructure for monitoring effectiveness

6. Capacity for researching and identifying effective programs and practices linked to CTE foundation and pathway standards

P–16 councils. California P–16 councils are being increasingly replicated at district and regional levels statewide. The outstanding advantage of these councils is their ability to grasp the big picture of local educational needs and strengths. Using this advantage, local councils can help muster backing for communitywide educational initiatives and the funding to support those initiatives.

Industry/certification alignment. CTE course work must also be aligned with industry and public certifications required for entry into and promotion within a pathway. For most certifications students must be eighteen years of age; but for some, such as Microsoft Office Systems certification, students may be of any age. CTE teachers must know the requirements for certification in their field as well as the requirements for apprenticeships where appropriate. The California Department of Education provides support for teachers in apprenticeship and preapprenticeship programs. (See http://www.cde.ca.gov/ci/ct/ap.)

Strongly aligned programs ensure that students have a carefully constructed scaffold on which each course builds and reinforces the preceding courses. Although the process of developing the alignment can be time-consuming, the results are rewarding for administrators, teachers, and students alike because they combine the separate strengths of multiple schools, instructors, and courses to support student success.

Conclusion

Partnerships, always an important part of CTE, have never been more essential than now as educational institutions strive to meet the needs of the twenty-first century workplace. Many partners continue to serve key traditional roles, such as sponsoring apprenticeship programs, serving on advisory committees, and providing professional development support. Some partners are placing new emphasis on traditional roles, such as the focus on articulation in CTE course work between middle school and high school. Still others are taking on relatively new roles, including workforce investment boards, which are funding internships and community colleges providing dual-credit CTE and CTE-related course work. These extensive, diverse partnerships are resulting in more rigorous CTE programs, course work better aligned to industry needs and better articulated with previous and future opportunities, and an invigorated CTE presence throughout the state.

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Chapter 5

Applications of CTE Foundation Standards

Each industry sector comprises two types of career technical education (CTE) standards: (1) pathway standards, which detail the CTE content to be mastered in each pathway; and (2) foundation standards, which delineate the knowledge and skills to be mastered in all pathways. Precedent for the foundation standards concept is found in several academic disciplines. For example, the science standards for grades nine through twelve include the universal investigation and experimentation standards, and the history–social science standards for grades nine through twelve include the history and social science analysis skills standards.

All students must master 11 foundation standards to succeed in learning the CTE curriculum and performing well in the workplace. The foundation standards are, in many ways, the equivalent of the competencies called for by the Secretary's Commission on Achieving Necessary Skills (SCANS).[1] That is, they reflect the knowledge, qualities, and skills that employers want in every employee. The specifics may be unique among sectors, especially for foundation standards 1, 2, and 10; but common themes run through standards 3–9 that are useful to explore. The foundation standards addressed in each sector are the following:

1.0 Academics
2.0 Communications
3.0 Career Planning and Management
4.0 Technology
5.0 Problem Solving and Critical Thinking
6.0 Health and Safety
7.0 Responsibility and Flexibility
8.0 Ethics and Legal Responsibilities
9.0 Leadership and Teamwork
10.0 Technical Knowledge and Skills
11.0 Demonstration and Application

1.0 Academics

Students understand the academic content required for entry into postsecondary education and employment in the chosen sector.

The first foundation standard, Academics, reflects standards in mathematics, science, history–social science, and visual and performing arts that are directly

applicable to the industry sector and will be taught and/or reinforced in sector course work. Along with the standards in 2.0, Communications, the 1.0 Academics standards are referred to throughout this framework as *academic foundation standards*. They are the subject of significant discussion in of the integration of academic foundation standards with CTE content pathway standards in chapters 1 and 2. Foundation academic standards are found in the Part II examples of assignments and assessments for all pathways.

Industry sectors differ significantly in the number and type of academic foundation standards chosen. Some sectors, such as Health Science and Medical Technology, list many standards in science; others, such as Public Services, emphasize history–social science. Guidance for implementing particular academic foundation standards may be found in the appropriate frameworks, available at http://www.cde.ca.gov/be/st/fr.

2.0 Communications

Students understand the principles of effective oral, written, and multimedia communication in a variety of formats and contexts.

The foundation Communications standards are primarily drawn from the English–language arts standards, although some sectors have additional industry-specific items. Like the Academics standards, foundation standards listed in 2.0 were chosen to reflect those concepts and skills taught or reinforced across all pathways. They also vary considerably between industry sectors. Foundation Communications standards are featured in the discussions of integrating academic and CTE content standards throughout this framework and prominently in the examples of assignments and assessments by pathway in Part II. Guidance in implementation is available through the *Reading/Language Arts Framework,* which may be viewed online at http://www.cde.ca.gov/be/st/fr.

3.0 Career Planning and Management

Students understand how to make effective decisions, use career information, and manage career plans.

Career Planning and Management differs from the other foundation standards in that disciplines other than CTE rarely if ever teach this essential knowledge and skill base. To ensure thorough guidance, this framework addresses the unique Career Planning and Management standards in relative depth.

In all 15 industry sectors CTE foundation standard 3.0 delineates the required knowledge and skills for Career Planning and Management in the following common standards:

- 3.1 Know the personal qualifications, interests, aptitudes, information, and skills necessary to succeed in careers.
- 3.2 Understand the scope of career opportunities and know the requirements for education, training, and licensure.

- 3.3 Develop a career plan that is designed to reflect career interests, pathways, and postsecondary options.
- 3.4. Understand the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.5 Understand the past, present, and future trends that affect careers, such as technological developments and societal trends, and the resulting need for lifelong learning.
- 3.6 Know important strategies for self-promotion in the hiring process, such as job applications, résumé writing, interviewing skills, and preparation of a portfolio.

Meeting these rigorous standards requires a logical, comprehensive system of career awareness, exploration, and preparation that begins in middle school and continues through the transition to work and/or postsecondary training or education.

Foundation standards 3.1 and 3.2. These standards call for an initial understanding of the range of career opportunities and the requirements for success in each. The activities most often included are interest inventories and aptitude testing, followed by students' research into possible careers reflected in their interest and aptitude data. Students' investigations generally include the personal qualifications, skills, education, training, and licensure necessary to succeed in various careers identified with the students' interests and aptitudes. Their findings then allow students to narrow and better define their interest.

Activities for foundation standards 3.1 and 3.2. Schools use a broad spectrum of activities to address these standards, including the following:

1. Online and pencil-and-paper assessments of interest, aptitude, values, and attitude
2. Classroom-based resources, such as *The Real Game California,* available from the California Career Resource Network at http://www.californiacareers.info, and other *Real Game* curricula, found at http://www.realgame.org
3. Online-, software-, or workbook-guided career exploration
4. Classroom speakers, career fairs, "power lunches," and informational interviews
5. Films and videos, such as those available online at http://www.cacareerzone.org
6. Research through online resources or textbooks, trade books, and reference books
7. Computer-based or physical games and activities

Most of these activities are commonly used in career awareness and exploration. Although less frequently used, the informational interview is particularly compelling because it involves active learning and connects career awareness and exploration with work-based learning. Also known as the research interview, it is one of the best sources for gathering information about an industry and the careers within it. The informational interview is the opposite of a job interview; that is, in the informational interview the student initiates an interchange by re-

questing an interview and asking questions. The student's purpose is not to gain employment but to explore careers and clarify a career goal, discover employment opportunities not advertised, build confidence for later job interviews, and access the most up-to-date career information.

Teachers assigning an informational interview usually require students to:

1. Identify a target career or industry through assessment and awareness activities.
2. Prepare for the interview by conducting appropriate research, developing potential questions, and conducting mock interviews in the classroom.
3. Identify persons who might be interviewed, beginning with personal networks and moving on to representatives of professional organizations, unions, employer organizations, and other sources.
4. Contact the individual to be interviewed (having secured his or her name from a phone call or Web site search) by letter or e-mail first and then by phone to arrange the interview.
5. Conduct the interview, using appropriate protocol (e.g., wearing appropriate clothing, being prompt, being professional in demeanor, responding to questions, taking notes as appropriate).
6. Follow up by recording all the information gathered in a standard reporting format and sending a thank-you note to the interviewee.

Interviewing is one of the English–language arts standards (Listening and Speaking, grades nine and ten, 2.3) incorporated into many of the CTE Communications foundation standards. To help students prepare for success in this standard, teachers may also provide some generic starter questions for the students to build on, such as the following:

1. On a typical day in this position, what do you do?
2. What part of this job do you find most satisfying? Most challenging?
3. How do you see jobs in this field changing in the future?
4. If you could do things all over again, would you choose the same path for yourself? Why? What would you change?
5. With the information you have about my education, skills, and experience, what other fields or jobs would you suggest I research further before I make a final decision?

Delivery methodologies. Middle schools and high schools have typically responded with a variety of delivery methods to address foundation standards 3.1 and 3.2. For an overview of the broad scope of careers, schools offer the following range of delivery points:

1. *Career awareness courses.* Many California high schools offer a one-semester career awareness course in the ninth or tenth grade that incorporates a variety of activities, resources, and materials. In some schools teachers of career awareness courses collaborate with English teachers so that career investigation results in a research or "I Search" paper that is graded and credited in

both the English class and the career awareness class. In most career awareness curricula, the school's CTE pathways and courses are reviewed for all students. Often, eleventh- and twelfth-grade students in CTE programs will be invited to speak in these courses, demonstrating their products, answering students' questions, and showing videos of their activities.

2. *Career awareness units in generic courses.* Some schools offer a generic one-semester course that addresses a potpourri of study skills, career awareness, and state requirements. These courses have titles such as Ninth Grade Orientation, Life Skills, or Preparing for Success. The career awareness unit in these courses usually provides access to the assessment tools mentioned previously, allows for some initial investigation, and provides an overview of CTE pathways, programs offered at the school, and courses available. The teachers can also work with the English department to assign a collaborative research paper.
3. *Career awareness units in advisory programs.* Advisory systems are a proven adjunct to high school counseling (see the discussion of advisory programs in *Aiming High*).[2] Schools with advisory systems often include career awareness and exploration as a part of the program each year in grades nine through twelve. The advantage of this approach is that as the students mature, their explorations do also. Information and activities presented in this venue are usually similar to those in the semester-long career awareness course, although they may be delivered across both grades nine and ten. The amount of time spent on career awareness activities in advisory programs varies greatly according to the advisory curriculum and the number of hours of advisory course time allotted per week. Because the counseling department frequently creates the career awareness curriculum as an advisory program, CTE teachers should work with the department to ensure that the information on CTE pathways and courses is included in the curriculum materials.
4. *Career awareness units in introductory CTE courses.* CTE introductory courses, including those provided in the middle schools, almost always include career awareness units about industry and offer information and exploration opportunities in related industries. Later, students can generalize the skills they learned while exploring target sector to increase their awareness of other industries. In introductory CTE courses the career awareness units always include a thorough exploration of CTE pathway options available at the high school level and their connection to postsecondary education and training.
5. *Career centers.* Many California high schools have dedicated career centers staffed through the district or the ROCP. How the centers are used varies widely. In some schools the career center delivers a career awareness curriculum, either in a unit or in a series of activities, during the school day or after school. For some the completion of the units or activities is optional; for others it is required. One advantage of using the career centers as delivery points is access to most of the school's career awareness and exploration materials and resources. Another advantage is that the school's CTE programs can

be promoted through literature, pathway-created videos, samples of student project work, and similar enticing displays.

6. *Career days and fairs.* The terms *career day, career fair,* and *job fair* are often used interchangeably to mean a time when students can visit booths sponsored by employers, public and private, to explore options and inquire about part-time, summer, or full-time postgraduation career opportunities. To maximize learning, most schools help students prepare for those events. They are encouraged to review the list of employers who will be represented, determine which booths to visit, conduct research on the companies and organizations, create a sound bite self-introduction (30 to 90 seconds about knowledge, skills, abilities, and course work completed), or develop a list of questions to ask. Students looking for jobs should also have their résumés and portfolios in hand, if appropriate. After the event students should be encouraged to write to at least one business to express appreciation for its participation. Career days are also excellent opportunities to advertise CTE course options. Each school district and ROCP program might have a separate booth featuring information, demonstrations, or games or use other methods to attract visiting students.
7. *Career exploration units in CTE concentration or capstone courses.* Most CTE concentration and capstone courses include in-depth study of an industry and pathway regarding career opportunities at various levels of education and training. At this point students are well into the career exploration process and are measuring themselves in comparison with the personal qualifications, skills, education, training, and licensure requirements for various occupations within the pathway. Through concentration and capstone course work, students further define their focus within the pathway, consistently adjusting as they reflect on their experience. CTE teachers take an active role in helping students make these judgments.
8. *Senior projects*. In many high schools that require senior projects, the projects must in some way reflect the student's current pathway choice. For example, a student planning to enter nursing might investigate the role of nurses in responses to international disasters, learn and report on how to help elderly patients remember to take their medications, or do a computer-generated model of nursing needs if California were subject to a terrorist Ebola attack. Because the purpose of senior projects is to improve inquiry and presentation skills in these young people who are almost adults as well as to expand their horizons, requiring that the project be related to a potential future career results in the mastery of multiple standards.

Materials and resources. Which materials and resources are chosen and how they are used in career awareness and exploration depend greatly on the venue for service delivery. For example, a full semester class of career awareness and exploration may use a specific textbook, whereas a career center-based program may use more online and hands-on activities.

As noted in Chapter 3, the California Career Resource Network (http://www.californiacareers.info) develops, disseminates, and provides training in the use of career development resources. These resources include *The California Career Planning Guide (CCPG), The California CareerZone,* and *The Real Game California*. The *CCPG* is a student-oriented self-help guide for developing a career action plan.

The California CareerZone (http://www.cacareerzone.com), California's first publicly supported career information delivery system, is available to students (and all other Californians) without charge and provides the following:

1. Self-assessment tools
2. Descriptions and essential information (e.g., skills, training required) for 900 nationally recognized occupations (O*NET, interactive occupational information) organized within California's 15 career technical education industry sectors
3. Current, accurate California labor market information
4. More than 300 career videos
5. *The Reality Check Budget Calculator* for comparing real-life living expenses with the wages available in a chosen career

The Real Game California is part of the internationally popular and effective *The Real Game Series.* By participating in role simulations and using California economic and workforce data, students learn career self-management competencies (e.g., knowledge, skills, attitudes). The relevance to their lives helps students focus more on their future and appreciate the importance of lifelong learning.

The Real Game California and *The Real Game Series* provide a cooperative, experiential, and safe means for students to:

1. Discover personal skills and talents.
2. Reinforce a positive self-concept.
3. Relate school experience to career choices and work roles.
4. Explore the relationship between work and broader life roles.
5. Be introduced to the concept of lifelong learning.

All activities in *The Real Game California* have been aligned with the following:

1. California's academic content standards
2. California's career technical education standards
3. National career development guidelines (revised in 2004)
4. American School Counselor Association's National Standards for Student Academic, Career, and Personal/Social Development
5. Secretary's Commission on Achieving Necessary Skills (SCANS) Employability Skills
6. Future content standards for adult literacy and lifelong learning

Foundation standard 3.3. This standard requires students to "develop a career plan that is designed to reflect career interests, pathways, and postsecondary op-

tions." Most guidance experts agree that all students should have an eight-year plan that facilitates their transition from middle school to high school, ensures that they will successfully complete four years of high school, and explores their postgraduation plans. These career plans include the following:

1. Appropriate choice of course work based on interests and goals
2. Strategies for successful transitions between middle school and high school
3. Strategies for successful transitions between high school and postsecondary training, education, and/or employment
4. Strategies for being successful at work

Career plans help individual students realize the benefits that come from planning and pursuing both short-term and long-term goals. Schools use a variety of approaches to this task, such as the following:

1. Creating and updating the plan in career awareness courses or units delivered through course work (stand-alone, generic, CTE), through the career center, or through advisory courses
2. Creating and updating the plan through individual counseling sessions

Schools often combine three plans (graduation, college, and career) so that students recognize the linkages and options available. These *success plans,* as they are sometimes termed, record career assessments (aptitude, attitude, interest), work-based learning, and short-term and long-term career goals; high school courses completed and final grades; information on progress toward graduation requirements; *STAR* and *CAHSEE* test results; and other academic test scores, such as the *EAP* and the *SAT*. With this information all in one plan, the counselor, adviser, or career center facilitator can help students link academic and CTE course progress with postsecondary goals.

Career or success plans are most valuable when they are updated regularly through annual meetings of the student with a school counselor, adviser, or career center facilitator. In this meeting the adult reviews the plan from the previous year, works with the student to update work-based experience and preparation, updates academic achievement and course completion, and helps the student reexamine and explore career interests.

Updating the plan keeps the student mindful of career preparation while selecting high school courses for the next year. Many schools send the career or success plan home for parents to sign, thereby reminding parents that career preparation is one of the purposes of a high school. Sometimes, the updating of the plan calls for the student to investigate further, such as conducting informational interviews. For assistance in completing the assignments, the student may be able to call on family members.

Foundation standard 3.4 states that students must "understand the role and function of professional organizations, industry associations, and organized labor in a productive society." Schools choosing to address this standard through the twelfth-grade economics course required for graduation must ensure that all students demonstrate mastery. The academic standard for Principles of Econom-

ics 12.4 states that "students analyze the elements of the U.S. labor market in a global setting." As part of that analysis, students must "understand the operations of the labor market, including the circumstances surrounding the establishment of principal American labor unions, procedures that unions use to gain benefits for their members, the effects of unionization, the minimum wage, and unemployment insurance" (foundation standard 12.4.1). This requirement is broad enough to include the elements of foundation standard 3.4 and, because it is in a course required for graduation, calls for mastery by all students.

Most CTE concentration and capstone courses also deal with the roles and realities of professional organizations, industry associations, and organized labor in the industry and in the pathway. CTE students often acquire firsthand knowledge of those groups through student organizations, such as HOSA and DECA, which may receive substantial support from employers, labor unions, and professional organizations. Consequently, students become well acquainted with the role those groups play in the economics of the industry.

Foundation standard 3.5 calls for students to "understand the past, present, and future trends that affect careers, such as technological developments and societal trends, and the resulting need for lifelong learning." Americans are witnessing vast changes in the nature and concept of work caused by globalization, developments in technology, and shifts in labor markets. The demand on workers to engage in many career and industry sector transitions throughout life—12 to 25 times according to several analysts[3]—means that students must master career self-management competencies they will use during a lifetime. Thus, the old concept of career exploration and guidance as a one-time event must be replaced by lifelong career self-management. And schools must help students master the requisite skills, knowledge, and attitudes.

The understanding called for in foundation standard 3.5 must be delivered in CTE course work, especially in concentration and capstone courses. However, to reach all students, schools should seriously consider addressing this standard in social studies courses, such as U.S. History and economics. In these classes students can learn about the changing economic forces that create the need for lifelong career self-management. The personal skills to accompany that knowledge are delivered through foundation standard 3.6.

Foundation standard 3.6. This standard requires that students "know important strategies for self-promotion in the hiring process, such as job applications, résumé writing, interviewing skills, and preparation of a portfolio." These key strategies for the future workforce include career self-management skills as well as what have historically been called employability skills. Employability skills focus on the system of traditional paid employment and the needs of employers in that system. Career self-management skills serve the needs of the students, equipping them with the skills they need to move repeatedly from one type of work and learning to another in the new workforce.

Many schools offer programs devoted to teaching employability skills. Generally, such programs are found in the following venues:

1. *Advisory programs.* Typically, advisory programs conduct appropriate skill-building activities for employability for students in grades nine through twelve. Employability skills, such as interviewing, developing and completing job applications, and developing electronic or physical portfolios are usually part of the curriculum in grades eleven and twelve. The advantage of this approach is that all students are given opportunities to master these essential skills. To be successful in this approach, the advisers should be supported in their teaching of these activities through professional development.
2. *Senior projects.* In schools that require senior projects related to a career pathway, many employability skills, especially interviewing, are taught as part of the preparation for the projects. If these projects are the school's primary venue for teaching employability skills, professional development can again become highly effective in ensuring that the skills are taught comprehensively.
3. *Internship and work experience programs.* Internship and work experience programs almost always teach employability skills, which are prerequisites for finding job leads and securing a position. A school requirement that all students serve internships effectively satisfies the employability skills portion of foundation standard 3.6. If not required, the school may use internship and work experience as the intensive point of delivery of those skills and provide more general training in another venue that reaches all students. Usually, the faculty member facilitating these activities has significant expertise in employability skills and may also be involved in staff development for other faculty members.
4. *Career centers*. In some schools the career center offers regular training in employability skills. Attendance is voluntary. The advantage of this system is that it provides the instruction as almost on-demand learning. The disadvantage is that not all students avail themselves of these services and thus may leave high school without the mastery of this standard.
5. *CTE concentration and capstone courses.* In almost all CTE concentration and capstone courses, including cooperative education and community classrooms, employability skills are taught to mastery. In some settings, such as career academies, the skills may not be part of the CTE course curriculum exclusively; that is, they may be taught in several venues. The advantage of this approach is that a student may have multiple exposures to learning the skills at different levels of maturity and understanding, resulting in a deeper level of mastery than a one-shot approach can provide. The disadvantage is that students not enrolled in CTE miss this important instruction unless the school has another venue for its delivery.

Recognition. The final element in a comprehensive, logical system of career exploration and preparation is a program of recognition. Although most schools offer certificates of completion for various benchmarks in CTE, not all do so in a way that affirms CTE's role in preparation for postsecondary training, education, and employment. Skills certification, completion of internships, training-related

job placement, industry certification, and articulation into advanced training are examples of accomplishments that warrant high-visibility public acknowledgment by the school in such venues as student award nights, press releases, graduation programs, and presentations. This level of recognition underscores the importance of students' career choices and career milestones at the high school level.

4.0 Technology

Students know how to use contemporary and emerging technological resources in diverse and changing personal, community, and workplace environments.

Although technology is used in most academic disciplines, it plays a unique role in CTE applied learning through the mandate that students master the tools of the trade used in the workplace. Technology permeates every pathway in every industry sector through such instruments as diverse as blood pressure cuffs, GPS, computer software programs, and digital lathes. Therefore, the three foundation standards in technology cited by all sectors emphasize a much more in-depth relationship to technology than is found in most other courses:

- 4.1 Understand past, present, and future technological advances as they relate to a chosen pathway.
- 4.2 Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.
- 4.3 Understand the influence of current and emerging technology on selected segments of the economy.

Foundation standard 4.1. This standard calls for students to understand the continuum of technological development in their chosen pathway. Understanding the development of tools in common use today imbues the student with not only a sense of the immense rate of technological change in the world of work but also an appreciation for the process of research and development in the pathway fields. Indeed, contemplating the science fiction of yesterday (e.g., moving sidewalks, incredibly fast trains, portable communication devices) allows students to include a sense of the possible when assessing projections of future applications of technology.

Activities related to this standard are easily included in assignments involving the pathway content standards. For example, when introducing a new power tool in the Cabinetmaking and Wood Products pathway, the teacher might add the history of the tool's development and perhaps even projections of future improvements to the normal list of safety, operations, and maintenance instruction. In fact, in Integrated Graphics Technology pathway courses in the Manufacturing and Product Development industry sector, some teachers have students reinvent earlier versions of the modern movie camera, such as a zoetrope or a phenakistiscope, to grasp the fundamentals of movie camera theory.

Foundation standard 4.2. Nearly every career requires an understanding of how to use technology to access, manipulate, and produce information, products, and services. Consequently, this is a major focus for CTE sectors. Included in

this single foundation standard are the primary uses of technology in the world of work: accessing information, products, and services; manipulating or adjusting them to fit immediate needs; and producing new information, more effective products, and higher-quality services. This focus also allows for a continuum of higher-order thinking skills instruction in CTE content, such as the following:

1. Mastering basic to sophisticated use as designed by the manufacturer
2. Adjusting the use of the information, products, or services to meet specific needs
3. Creating information, products, and services to meet existing needs or address developing needs more effectively

Activities to implement this standard at level 1 (basic use as designed by the manufacturer) are inherent in every sector pathway. Teachers may step beyond simple mastery of the use of products in concentration or capstone courses as they strive to move their students from the comfort zone of the predictable to the actual world of constant change. Some teaching reflects level 2, the adjust or modify level, as an option in an assignment to earn the advanced level on the rubric. For example, students in the Accounting Services pathway in the Finance and Business industry sector might learn to use basic spreadsheet software to earn a proficient rating but could be called upon to adjust the standard templates to meet specified, unique needs to earn an advanced rating.

Foundation standard 4.3. Much of the manufacturing workforce in America was totally unprepared for the scope and rapidity with which technological advances and the globalization of the economy decimated middle-class, blue-collar jobs in the last quarter of the last century. Standard 4.3 calls for CTE students not only to understand the influence of technological change on the pathway job market but also to grasp the potential impact of technological advances on existing and future products and services. For example, students may be asked not only to envision a world in which communications in sight, sound, and text are commonly conducted at a distance through a wristwatch but also to analyze the potential effects of such a technological advance, for example, on computers, telephones, wristwatches, and television production. Also to be considered are the effect on marketing, sales, and service as well as on business, recreation, education, and many other sectors.

Activities to implement this standard can stand alone. That is, students might be required to consider one element of technology commonly used in the pathway and research the impact of potential improvements or replacement products under discussion in the industry. Another option would be to frame the activity as an advanced level on a rubric measuring proficiency in basic use.

5.0 Problem Solving and Critical Thinking

Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques.

Although problem-solving and critical thinking skills are required in every secondary school discipline, perhaps only in CTE are these skills focused primarily on real-world applications. Granted, developing such skills is essential for all students. However, the relationship between intelligence and critical thinking and problem solving is not linear; that is, one skill does not necessarily produce the other. Intelligence provides the raw material for producing critical thinking and problem-solving skills, and all students deserve an opportunity to apply their intelligence to producing such skills.

The workplace no longer offers a hierarchy in which frontline workers complete mindless and repetitive tasks while their supervisor (or the supervisor's supervisors) solves problems. Employers expect high school graduates to be able to apply problem-solving skills in an appropriate, timely manner. All sectors have included the following problem-solving and critical thinking standards in their foundation standards:

- 5.1 Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
- 5.2 Understand the systematic problem solving models that incorporate input, process, outcome, and feedback components.
- 5.3 Use critical thinking skills to make informed decisions and solve problems.

Foundation standards 5.1 and 5.3: These standards require students to apply a suitable problem-solving and/or critical thinking strategy at the right time to generate appropriate decisions and/or solutions. Problem-solving models are addressed in standard 5.2, but students must also understand, as well as practice, critical thinking. Understanding critical thinking is part of metacognition, or learning about learning, which strengthens intellectual capacity.

As research has demonstrated and Robert Marzano and others have translated for mainstream educators, questioning techniques do make a significant difference in the level of critical thinking promoted in the classroom.[4] In *Critical Thinking: How to Prepare Students for a Rapidly Changing World*, Richard Paul demonstrates the use of Socratic questioning techniques to build critical thinking skills.[5] In this approach a response to a question leads to another type of question not predetermined by the instructor. For example, a response to a question that calls for analysis, such as contrasting the safety guarantees of two child-restraint systems for automobiles, might be followed by a question for clarification (e.g., What do you think is the primary difference?). Another question might probe assumptions (e.g., What is your lab partner assuming in her response?). Or a question might be offered that probes reasoning and evidence (e.g., What other information do you need to make a decision?).

Teaching these standards in CTE courses involves the following steps:

1. Raising student awareness about critical thinking—what it is and how it is done (the metacognition approach to instruction)
2. Having students practice critical thinking through strategies such as those discussed previously

3. Asking students to use critical thinking strategies and methodologies in applied decision-making situations

Foundation standard 5.2. This standard calls upon teacher to provide the same kind of metacognitive transparency for problem-solving approaches as described previously for critical thinking. In fact, the standard requires that students learn and apply a problem-solving approach.

There are many problem-solving approaches, some specifically designed for certain disciplines, such as physics or mathematics. But almost all incorporate input, process, outcome, and feedback components. For example, the "Big 6," a commonly used problem-solving model, calls for students to:

1. Define the problem and information needed, select the best information source, and locate the source and information: steps 1–3, input.
2. Use the information: step 4, process.
3. Synthesize the information: step 5, output.
4. Evaluate the product: step 6, feedback.[6]

Another model, explained in depth at http://groups.physics.umn.edu/physed/Research/CRP/psintro.html, calls for students to:

1. Comprehend the problem (input).
2. Represent the problem in formal terms (process).
3. Plan a solution (process).
4. Execute the plan (product).
5. Interpret and evaluate the solution (feedback).[7]

To help students master this standard, teachers need to:

1. Choose a problem-solving approach and then teach students how to use it. This approach is best when adopted schoolwide.
2. Assign written and laboratory exercises on problem solving that require the use of the structured approach.
3. Call upon students to apply the approach in their performance tasks.
4. Assess the degree to which students understand and can apply the approach (as well as the results of the application).
5. Determine what needs to be retaught or reinforced and adjust future instruction.

6.0 Health and Safety

Students understand health and safety policies, procedures, regulations, and practices, including the use of equipment and handling of hazardous materials.

Health and safety issues are a primary concern for both CTE teachers and employers. The Health and Safety foundation standards reflect that concern in two ways, calling for (1) knowledge of the formal policies and regulations of the industry and the wider public health and safety requirements; and (2) understanding of the less formal but equally important health and safety practices of

the industry. These two levels are captured in the Health and Safety foundation standards common to all sectors:

- 6.1 Know the policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities.
- 6.2 Understand critical elements of health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.

Both standards are very clear and have been a part of the CTE curriculum in most sectors for decades. As products, services, and circumstances change, the CTE health and safety curriculum must be adapted to reflect those changes. For example, the spread of HIV infection has opened a new chapter on safety issues for workers providing health care, human services, and child care. New products or innovations in old products require similar analysis for health and safety issues. And in the unpredictable real world, catastrophes such as pandemics, terrorism, or natural disasters are ever-present possibilities. CTE teachers will continue to monitor those changes and provide the necessary instruction to keep students healthy and safe in the classroom and in the workplace.

7.0 Responsibility and Flexibility

Students know the behaviors associated with the demonstration of responsibility and flexibility in personal, workplace, and community settings.

In CTE course work, more than in any other discipline, accepting responsibility, functioning in an accountable environment, and demonstrating flexibility represent essential knowledge and skills. These skills must be taught in every aspect of CTE to ensure that program graduates are both good employees and good citizens.

This imperative is captured in the four common foundation standards for Responsibility and Flexibility:

- 7.1 Understand the qualities and behaviors that constitute a positive and professional work demeanor.
- 7.2 Understand the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to varied roles and responsibilities.
- 7.4 Understand that individual actions can affect the larger community.

Foundation standards 7.1, 7.2, and 7.4. These standards deal with responsibility, one of the most important employee qualities, as identified by the Secretary's Commission on Achieving Necessary Skills (SCANS) and noted by research analyses of employer responses.[8] Responsibility is on practically every list of important concepts to be taught in character education. While pundits have speculated on why this quality is emphasized, the most straightforward reason may be the most accurate. Simply put, it is the characteristic found most wanting in today's youths.[9] For some students, especially those given appropriate responsibility at home, taking responsibility for their actions at school, in the community,

and in the workplace is a given. For others who may have been denied opportunities to learn responsibility at home, accepting responsibility and dealing with accountability may be extremely difficult.

CTE teachers are in a unique position to help students develop an appropriate sense of responsibility and accountability because industry standards and expectations often provide clear benchmarks as to what is and is not an acceptable product or level of service. Holding students accountable to this tangible level of acceptability also helps them understand the importance of upholding their responsibilities as individuals and as members of groups.

Using standards-based performance-task assignments and rubrics to assess learning and production underscores the student's responsibility and accountability. If applicable, the responsibility is clearly defined in the assignment and in the group's role, and accountability is delineated in the rubric. Using the terms *responsibility* and *accountability* in the assignment and rubric as well as in direct instruction and discussion in the classroom helps adolescents recognize the connection between expected performance and behavior and accountability measures. Many of the rubrics used as examples in Part II of this publication reflect that approach.

Foundation standard 7.3. This standard addresses directly the need for flexibility in the workplace, one of the most important job skills of the twenty-first century. The rate of change in the American economy and workplace today is dazzling; tomorrow it may well be overwhelming for all who are not sufficiently flexible.

CTE teachers must discuss this need for flexibility in every aspect of the curriculum. They may require that students demonstrate flexibility by asking them to assume different roles in a process or reflect on a performance task from a variety of perspectives, as exemplified in the Ford Partnership for Advanced Studies (Ford PAS) curriculum.[10] CTE teachers may also evaluate students specifically on their capacity to be flexible as demonstrated by their ability to solve a problem "in the moment" or make sound decisions in the middle of a task when conditions change.

8.0 Ethics and Legal Responsibilities

Students understand professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational norms.

Building on the theme of responsibility, foundation standard 8.0 requires that students understand ethical and legal actions in the workplace. More than in any previous generation, students in California's CTE programs today will function in a professional world fraught with ethical conflicts and increasingly litigious approaches to problem solving. Although such scandals are not new, the gap between expected and actual ethical behavior in the public and private sectors may never have been greater than it is today. The twenty-first century world of work requires that secondary students have a firm grounding in and understanding of

major existing laws and regulations in their chosen pathway and the importance of integrity and ethical behavior in the workplace.

This learning is captured in three foundation standards in Ethics and Legal Responsibility cited in every sector:

- 8.1 Know the major local, district, state, and federal regulatory agencies and entities that affect the industry and how they enforce laws and regulations.
- 8.2 Understand the concept and application of ethical and legal behavior consistent with workplace standards.
- 8.3 Understand the role of personal integrity and ethical behavior in the workplace.

Foundation standard 8.1. This relatively straightforward standard focuses on public regulatory laws and agencies and is generally handled in a lesson or unit with direct instruction in the laws and regulations that affect an industry. When greater attention is appropriate, CTE teachers may delve into the history of a law or regulation, having students uncover the actions or issues that caused the law or regulation to be imposed and learn whether the law or regulation has (or has not) generated the intended result.

Foundation standards 8.2 and 8.3. These standards focus on the integrity and ethics practiced by individuals in the workplace. Although these standards clearly involve values, very few parents or guardians or community members would challenge instruction in the importance of integrity and the need to demonstrate ethical behavior.

How these standards will be taught and assessed will depend greatly on the course content. Some CTE courses require discussion and demonstration of workplace ethics, such, for example, as courses aimed at the legal profession in the Legal and Government Services pathway or courses in the Accounting Services pathway. But all courses require serious examination of ethics in the workplace. When employers report that their primary source of financial loss is not production problems, transportation issues, or retail pilferage but employee theft,[11] America has an ethical problem that must be addressed.

9.0 Leadership and Teamwork

Students understand effective leadership styles, key concepts of group dynamics, team and individual decision making, the benefits of workforce diversity, and conflict resolution.

The importance of leadership and teamwork in the modern workplace cannot be overstated. Employer data reveal that at least 80 percent of the work done across industry sectors is accomplished in work groups or in direct relationship to team decisions or direction.[12] This learning is captured in the five foundation standards in Leadership and Teamwork cited in every sector:

- 9.1 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace settings.

- 9.2 Understand the ways in which preprofessional associations and competitive career development activities enhance academic skills, promote career choices, and contribute to employability.
- 9.3 Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
- 9.4. Know multiple approaches to conflict resolution and their appropriateness for a variety of situations in the workplace.
- 9.5. Understand how to interact with others in ways that demonstrate respect for individual and cultural differences and for the attitudes and feelings of others

Foundation standards 9.1, 9.3, and 9.4. The first standard focuses on developing student knowledge of the definitions of leadership, teamwork, and citizenship; developing students' understanding of the importance of these skills; and helping students understand how these skills benefit the individual and the group in various settings: school, community, and workplace. The second two standards focus on the skills necessary to demonstrate leadership and teamwork, specifically structuring individual work and teamwork to reach performance goals and demonstrating respect for other people.

Leadership is a dynamic, relational process. It is a quality and skill that can and should be taught in CTE classrooms. Although there may be some born leaders, there are many more youths who can learn leadership skills through study, diligent practice, feedback, and more practice. These skills can be taught and assessed by being incorporated into the performance-task assignment and rubric assessments as demonstrated in Part II. Students in CTE courses have exceptional opportunities to expand their understanding of leadership and develop leadership skills because much of the classroom and laboratory study occurs in working groups.

Of course, along with leadership come responsibility and accountability, underscoring the same themes explored in foundation standards 7.0 and 8.0 and corroborating the essential nature of these qualities in the workplace. In fact, perhaps the most famous definition of leadership, that of President Truman, focuses directly on these two characteristics: "The buck stops here!"

A second essential skill in the twenty-first century workplace is effective teamwork. In the school setting collaboration in cooperative learning groups allows students to produce a joint product for which they are commonly responsible. Teamwork projects should have clearly identified and separately evaluated responsibilities for each team member so that individual mastery of standards can be tracked and group accountability for the final product can be determined. Team members are assessed on the quality of the product, of their contributions to the team effort, and of the completion of their individually assigned tasks.

However, teams do not magically emerge when groups are formed. Indeed, the qualities of effective teams are often not found in groups unless the groups are explicitly trained in teamwork and assessed on implementation. Fundamental to the development of effective teams are the following steps, which can form the basis for a teamwork rubric:

- *Establishing understanding, commitment, and clear roles.* Team members understand that both personal and team goals are best accomplished with mutual support. Time is not wasted struggling over "turf" or attempting personal gain at the expense of others. The group identifies needed roles, and members volunteer for equal shares of the work. Consequently, they are committed to the common goals that they help establish.
- *Promoting creativity and universal contribution.* Team members contribute to the group's success by applying their unique talents, knowledge, and creativity to team objectives. They participate in decision making and fulfill their part of the performance task.
- *Building trust.* Team members are encouraged to express openly ideas, opinions, disagreements, and feelings. Questions are welcomed. Members practice open and honest communication, trying to understand each other's point of view. Expressions of opinion or disagreement are not considered divisive or nonsupportive.
- *Learning and practicing conflict resolution.* Team members recognize that conflict is a normal aspect of human interaction and view such situations as opportunities for new ideas and creativity. They work to resolve conflict quickly and constructively.

Structuring group and individual work to be accomplished in a given time frame is another important aspect of the foundation standards. Teachers can scaffold the learning of these skills, beginning with highly structured approaches to allocating work for the group and individuals and managing their time progressively easing students into developing and managing their own tasks and work plans. Over the course of a year, this approach requires teachers to:

1. Separate the whole job into discrete parts and assign due dates for each part. This practice is common in many classrooms.
2. Separate part of the job into discrete parts with due dates and require students to separate the remainder of the task and assign due dates, providing suggestions as to how they may approach the division of jobs and duties. Review their work plan against the rubric and help the students improve their work by making adjustments.
3. Provide the whole task, suggesting approaches students might take to divide the task into smaller jobs. Assign those jobs to individuals or the whole group and establish due dates. Review their work plan against the rubric and provide feedback.
4. Provide the whole task and require students to submit their work plan and timeline before starting on the project. Review the plan against the rubric.

Foundation standards 9.2 and 9.5. These standards directly address preprofessional associations and student-based organizations, such as career technical student organizations (CTSOs). CTSOs are discussed at length in Chapter 1. CTE teachers who wish to initiate chapters of CTSOs at their school should contact the state or national organizations listed. Where a formal CTSO does not exist,

CTE instructors can develop a student club with many of the features of the existing CTSO organizations.

10.0 Technical Knowledge and Skills

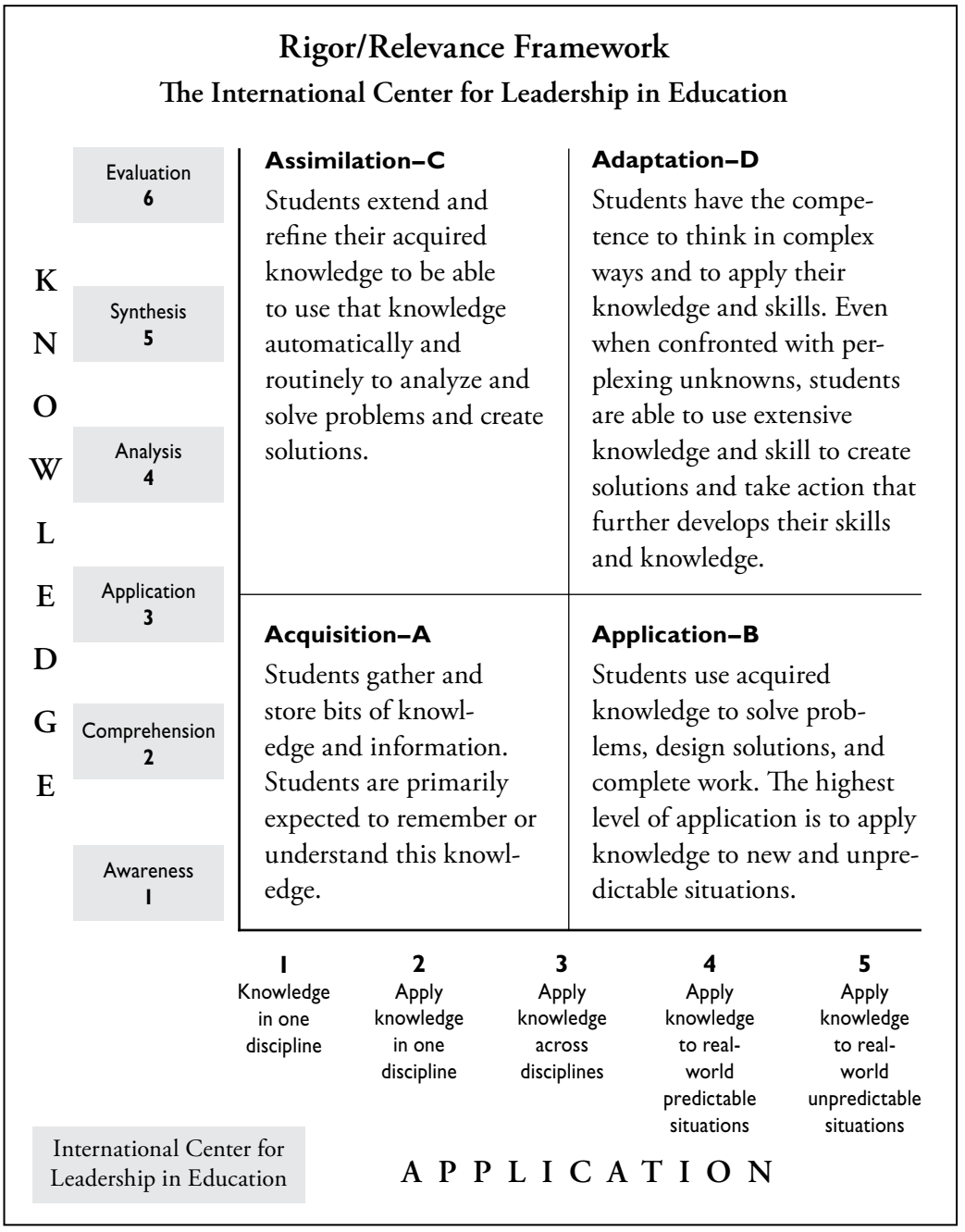
Students understand the essential knowledge and skills common to all pathways in the industry sector.

This foundation standard allows the industry sector to describe the specific requirements for all pathways not covered in the previous nine foundation standard areas. The requirements are unilaterally industry-specific and carry the expectation of being taught in every course. For example, in the Engineering and Design industry sector, Technical Knowledge and Skills standard 10.7 calls for students to "understand the need and process to obtain and maintain industry-standard, technical certifications and affiliations with professional organizations, including the American Society for Engineering Education, the Accreditation Board for Engineering and Technology, and the American Society of Civil Engineers."

11.0 Demonstration and Application

Students demonstrate and apply the concepts contained in the foundation and pathway standards.

This foundation standard exists in every industry sector to ensure that CTE courses are focused on applied learning and demonstrated skills in relation to the foundation and pathway standards. It carries the all-important message that CTE is about knowledge and skills—but knowledge and skills that must be mastered at the highest level of learning, expressed as adaptation or quadrant D on Willard Daggett's framework, shown on the following page.[13]



Notes

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Part II
Industry Sectors

This publication, the *California Career Technical Education Framework,* provides resources for implementing the *California Career Technical Education Model Curriculum Standards.*[1] Part II of this publication deals with 15 industry sectors. Each sector contains a brief introduction and sample standards-aligned curricula for an industry's career pathways, including the following:

- Sample course sequences
- Foundation and pathway standards appropriate to a sample course
- Analysis or "unpacking" of one standard for the sample course, with benchmarks for concepts and skills
- A sample standards-aligned performance task for a sample course, with an accompanying standards-aligned rubric for assessment
- A sample of pathway occupations, organized by level of education or training required

Note: The items provided are to be considered only as examples. Course content, course names, and course sequences will vary widely at the local level. Pathway occupations are far more varied than a brief list could accurately represent, and pathway exemplars are only subject-specific illustrations of the processes, techniques, and tools discussed in Part I.

This framework can be adapted to the needs of any California educational delivery environment and will be helpful to those involved with career technical education (CTE) program development, delivery, and support at the course, school, and district levels.

Educators using this document to build a standards-aligned curriculum or course in a CTE field will find the following sections particularly helpful:

- Chapter 1, which explains how to structure a standards-based curriculum, including delivery modes, creation of CTE programs, curriculum development, and contextual learning
- Chapter 2, which explains how to plan and deliver standards-based lessons, including assessment, lesson and unit development and planning, and research-based instructional strategies
- The appropriate industry sectors, which provide pathway-specific examples for standards-based curriculum development, lesson planning, and instruction

Educators should bookmark, print, or photocopy their relevant pathways to have them ready for reference as they review chapters 1 and 2, which contain the contextual detail and information needed for solid standards-aligned curriculum design, planning, and instruction. They may also wish to explore Chapter 5, which examines the concept of foundation standards and their application in greater depth in a CTE curriculum.

Administrators and other individuals charged with developing a CTE program at the school or district level will find chapters 3 and 4 particularly helpful. Chapter 3 discusses plan components, including funding for CTE courses, internal and external review, and professional development within a CTE context. Chapter 4 discusses key stakeholders within the school and the community and their roles in CTE program development.

All standards referenced in Part II are cited in full, with sufficient identifying information to make them easy to locate in the *California Career Technical Education Model Curriculum Standards.* To ensure that students meet current workplace requirements, teachers may choose to teach foundation or pathway standards taken from other pathways within the sector, other industry sectors, or other subject areas.

The industry sectors and their abbreviations are as follows:

Agriculture and Natural Resources Industry Sector (ANR)

Arts, Media, and Entertainment Industry Sector (AME)

Building Trades and Construction Industry Sector (BTC)

Education, Child Development, and Family Services Industry Sector (ECDFS)

Energy and Utilities Industry Sector (EU)

Engineering and Design Industry Sector (ED)

Fashion and Interior Design Industry Sector (FID)

Finance and Business Industry Sector (FB)

Health Science and Medical Technology Industry Sector (HSMT)

Hospitality, Tourism, and Recreation Industry Sector (HTR)

Information Technology Industry Sector Overview (IT)

Manufacturing and Product Development Industry Sector (MPD)

Marketing, Sales, and Service Industry Sector (MSS)

Public Services Industry Sector (PS)

Transportation Industry Sector (TRANS)

Note

1. California Department of Education, *California Career Technical Education Model Curriculum Standards, Grades Seven Through Twelve.* Sacramento: California Department of Education, 2005.

Agriculture and Natural Resources Industry Sector

Agriculture, one of California's largest, most vital industries, generates about $32 billion in products and more than $125 billion of economic impact each year. Ten percent of California workers are engaged in agriculture and related occupations. Because the demand for agricultural specialists throughout the state in both urban and rural areas is high, there are more job openings than there are qualified applicants. Within the Agriculture and Natural Resources pathways, workers in some of the fastest-growing and/or highest-wage occupations in California include agricultural marketing and sales personnel, agricultural engineers, laboratory and research technicians, animal reproduction specialists, environmental scientists, landscape and turf managers, and pest management specialists.

Students in the Agriculture and Natural Resources industry sector are engaged in an instructional program that integrates academic and technical preparation, with a focus on career awareness, career exploration, and skill preparation in seven pathways. The pathways emphasize real-world, occupationally relevant experiences of significant scope and depth in Agricultural Business, Agricultural Mechanics, Agriscience, Animal Science, Forestry and Natural Resources, Ornamental Horticulture, and Plant and Soil Science. Integral components of classroom and laboratory instruction, supervised agricultural experience projects, and leadership and interpersonal skill development prepare students for continued training, advanced educational opportunities, and entry into a career.

Agriculture and Natural Resources Industry Sector Pathways:

- Agricultural Business
- Agricultural Mechanics
- Agriscience
- Animal Science
- Forestry and Natural Resources
- Ornamental Horticulture
- Plant and Soil Science

Agricultural Business

Sample sequence of courses in the Agricultural Business pathway:

CTE courses	Related courses
Introductory • Introduction to Agriculture	• Work Experience Education • Speech and Communication • Information Technology sector courses • Government • Accounting • Chemistry
Concentration • Agricultural Biology • Integrated Agricultural Science • Ornamental Horticulture • Plant Science • Animal Science • Agricultural Computers	
Capstone • Agricultural Business Management • Agricultural Sales and Service • Agricultural Economics and Policy	

Sample of appropriate foundation and pathway standards for the Agricultural Business Management course in the Agricultural Business pathway:

Foundation standards	
	Academics 1.1 Algebra I (grades eight through twelve) 13.0: Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.
	Academics 1.3 Principles of Economics (grade twelve) 12.2.2: Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of **particular products.**
	Communications 2.1 Reading Comprehension (grades eleven and twelve) 2.3: Verify and clarify facts presented in other types of expository texts by using a variety of consumer, workplace, and public documents.
	Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.8: Integrate databases, graphics, and spreadsheets into word-processed documents.
	Career Planning and Management 3.4: Understand the role and function of professional organizations, industry associations, and organized labor in a productive society.
	Problem Solving and Critical Thinking 5.1: Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
	Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
	Technical Knowledge and Skills 10.3: Understand the importance of maintaining and completing the California Agricultural Record Book.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards	**ANR A1.0:** Students understand decision-making processes within the American free enterprise system.
	ANR A2.0: Students understand the fundamental economic principles of agribusiness and agricultural production.
	ANR A3.0: Students understand the role of credit in agribusiness and agricultural production.
	ANR A4.0: Students understand proper accounting principles and procedures used in business management and tax planning.
	ANR A7.0: Students understand agricultural marketing systems.
	ANR A8.0: Students understand the sales of agricultural products and services.
	ANR A9.0: Students understand local, national, and international agricultural markets and how trade affects the economy.

Sample analysis ("unpacking") of a standard for the Agricultural Business Management course in the Agricultural Business pathway:

Standard	**Agriculture and Natural Resources A4.0:** Students understand proper accounting principles and procedures used in business management and tax planning.	
Standard subcomponent	**Agriculture and Natural Resources A4.6:** Understand how to determine the tax obligations for an agribusiness.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Which tax forms to use 2. Which records generate the information for those tax forms 3. Current relevant tax codes 4. Tax obligation reduction strategies	*Benchmarks* 1. Name three relevant forms. 2. Cite three records. 3. Cite three relevant codes. 4. Cite two strategies for reducing tax obligation.
What should students be able to do? At what level?	*Skills* 1. Read and follow tax-related directions. 2. Transfer information from records to tax forms. 3. Complete forms properly. 4. Reduce tax obligation from the example.	*Benchmarks* 1. Obtain two sets of instructions and follow the directions. 2. Complete all transfers correctly. 3. Complete all forms correctly. 4. Identify two appropriate strategies for reducing tax obligation.
Topics and contexts **What must be taught?**	1. Knowledge of preceding concepts 1–2 2. Depreciation 3. Transferring figures 4. Current relevant tax codes 5. Tax obligation reduction strategies 6. Using tax forms and records	

Sample Performance Task

Standards: This sample performance task targets the following Agriculture and Natural Resources industry sector foundation and Agricultural Business pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Algebra I (grades eight through twelve) 13.0	Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.
Foundation: Problem Solving and Critical Thinking 5.1	Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway: ANR A4.6	Understand how to determine the tax obligations for an agribusiness.

Assignment: **Determining Tax Obligation and Completing Tax Forms**

In this assignment you will:

1. Complete Schedule F, Schedule SE, and Fuel Rebate Schedule 1028 from information generated from the simulated farming operation's journal and checkbook. Working individually and using your simulated family farming operation records (Leadership and Teamwork 9.3), you will:
    a. Complete a depreciation sheet (Academics 1.1 Algebra I 13.0; Leadership and Teamwork 9.3; Demonstration and Application 11.0).
    b. Prepare a balance sheet, financial statement, and cash flow summary (Academics 1.1 Algebra I 13.0; Leadership and Teamwork 9.3; Demonstration and Application 11.0).
    c. Complete a Schedule F (ANR A4.6; Leadership and Teamwork 9.3; Demonstration and Application 11.0).
    d. Complete a Schedule SE (ANR A4.6; Leadership and Teamwork 9.3; Demonstration and Application 11.0).
    e. Complete a Schedule 1028 (ANR A4.6; Leadership and Teamwork 9.3; Demonstration and Application 11.0).
2. Determine and tell the class how that tax obligation can be reduced by adjustments to inventory or purchasing (Problem Solving and Critical Thinking 5.1; Demonstration and Application 11.0).

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ANR A4.6: Understand how to determine the tax obligations for an agribusiness.	Student completes all three forms within 5 percent of the correct total.	Student completes all three forms within 15 percent of the correct total.	Student completes all three forms within 25 percent of the correct total.	Student does not complete all three forms within 25 percent of the correct total.
Academics 1.1 Algebra I (grades eight through twelve) 13.0: Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.	Student makes all calculations on the depreciation, balance, financial statement, and cash flow sheet with 95 percent accuracy.	Student makes all calculations on the depreciation, balance, financial statement, and cash flow sheet with 85 percent accuracy.	Student makes all calculations on the depreciation, balance, financial statement, and cash flow sheet with 75 percent accuracy.	Student does not make all calculations on the depreciation, balance, financial statement, and cash flow sheet with greater than 75 percent accuracy.
Problem Solving and Critical Thinking 5.1: Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.	Student provides three examples of how to reduce the tax obligation through inventory or purchasing adjustments.	Student provides two examples of how to reduce the tax obligation through inventory or purchasing adjustments.	Student provides one example of how to reduce the tax obligation through inventory or purchasing adjustments.	Student does not provide examples of how to reduce the tax obligation through inventory or purchasing adjustments.
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.	Student sets and meets timelines exceptionally well, organizes materials, completes assignments before they are due, and does so with accuracy.	Student sets and meets timelines, organizes materials, and completes assignments on time and with accuracy.	Student sets and meets timelines minimally, organizes materials, and completes assignments with some confusion.	Student struggles with setting and meeting timelines and organizing materials or completes assignments inaccurately.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Agricultural Business Pathway Occupations	
High school (diploma)	• Agricultural Retail Salesperson • Equipment Parts Salesperson • Agricultural Lending Office Clerk
Postsecondary training (certification and/or AA degree)	• Farm Realtor/Appraiser • Customer Service Representative • Farm Accountant
College or university (bachelor's degree or higher)	• Agricultural Supplies Purchasing Agent/Buyer • Agricultural Sales and Marketing Manager • Agricultural Commodity Broker*

Agricultural Mechanics

Sample sequence of courses in the Agricultural Mechanics pathway:

CTE courses	Related courses
Introductory • Introduction to Agricultural Mechanics • Introduction to Agriculture	• Geometry • Physics • Electronics, Manufacturing, Technology courses • Power, Energy, andTransportation Technology courses • Drafting courses (CAD, CAM)
Concentration • Advanced Agricultural Mechanics • Agricultural Welding • Agricultural Small Engines	
Capstone • Agricultural Fabrication/Construction • Agricultural/Farm Power and Equipment	

Sample of appropriate foundation and pathway standards for the Advanced Agricultural Mechanics course in the Agricultural Mechanics pathway:

Foundation standards	**Academics 1.1 Algebra I (grades eight through twelve) 10.0:** Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.
	Academics 1.1 Geometry (grades eight through twelve) 8.0: Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures.
	Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.c: Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.

	Communications 2.1 Reading Comprehension (grades nine and ten) 2.6: Demonstrate use of sophisticated learning tools by following technical directions (e.g., those found with graphic calculators and specialized software programs and in access guides to World Wide Web sites on the Internet).
	Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 1.1: Formulate judgments about the ideas under discussion and support those judgments with convincing evidence.
	Health and Safety 6.2: Understand critical elements of health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.
	Health and Safety 6.5: Use tools and machines safely and appropriately.
	Responsibility and Flexibility 7.6: Know how to apply high-quality craftsmanship to a product or presentation and continually refine and perfect it.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**ANR B1.0:** Students understand personal and group safety.
	ANR B5.0: Students understand agricultural cold metal processes.
	ANR B7.0: Students understand oxy-fuel cutting and welding.
	ANR B8.0: Students understand electric arc welding processes.

Sample analysis ("unpacking") of a standard for the Advanced Agricultural Mechanics course in the Agricultural Mechanics pathway:

Standard	**Agriculture and Natural Resources B8.0:** Students understand electric arc welding processes.	
Standard subcomponent	**Agriculture and Natural Resources B8.3:** Weld a variety of joints in various positions.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Safety equipment and procedures 2. Parts and functions of the power source 3. How to evaluate material, equipment, and electrode selection to determine proper operational settings 4. How the welding process works 5. Different joints and positions and their uses	*Benchmarks* 1. Wear protective clothing and goggles. Operate equipment safely. 2. Name parts and explain the functions. 3. Determine and list proper settings for three examples. 4. Explain the principles and process of arc welding. 5. Name four joints and three positions.

What should students be able to do? At what level?	*Skills* 1. Strike an arc. 2. Run beads. 3. Fill a piece of steel with beads that are overlapped and layered. 4. Remove slag. 5. Analyze the quality of the work.	*Benchmarks* 1. Strike and maintain an arc five times out of five attempts. 2. Run uniform, properly penetrating beads. 3. Run beads properly: bead width is even, penetration is half the thickness of the bead, puddles are evenly spaced and equal in size, rows overlap previous rows halfway and are straight, layers are smooth and even. 4. Present welds that are free of slag. 5. Evaluate welds accurately.
Topics and contexts **What must be taught?**	1. Basic arc welding processes, equipment, and safety 2. Arc welding settings and adjustments 3. Proper angle, speed, electrode selection 4. Use of technical manuals	

Sample Performance Task

Standards: This sample performance task targets the following Agriculture and Natural Resources industry sector foundation and Agricultural Mechanics pathway standards:

Standard number	Standards
Foundation: Academics 1.2 Science Investigation and Experimentation (grades nine through twelve) 1.c	Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.
Foundation: Health and Safety 6.5	Use tools and machines safely and appropriately.
Foundation: Responsibility and Flexibility 7.6	Know how to apply high-quality craftsmanship to a product or presentation and continually refine and perfect it.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway: ANR B8.3	Weld a variety of joints in various positions.

Assignment: Padding a Plate

You will individually obtain a 4" × 5" × 1/4" steel plate and 1/8" E-6013 electrodes and proceed to pad the plate with 3.5 perpendicular layers of overlapping beads (ANR B8.3). Identify and demonstrate safe equipment setup, operation, and cleanup (Health and Safety 6.5). Then you will:

1. Establish an arc and run a stringer bead parallel to and along one of the long edges of the plate.
2. Fill the craters at the end of each weld.
3. Run more beads alongside the previous bead. Ensure that the far edge of the bead is in the center of the previous bead.

4. Chip the slag, clean the weld thoroughly after each pass, and cool the weld.
5. Evaluate the quality of each bead and identify and correct any problems.
6. Continue making passes until the plate is covered.
7. Turn the plate 90 degrees and weld a second layer.
8. Weld 3.5 layers.
9. Stamp your number on the plate and submit it for evaluation (Academics 1.2 Investigation and Experimentation 1.c; Health and Safety 6.5; Responsibility and Flexibility 7.6; Demonstration and Application 11.0).

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ANR B8.3: Weld a variety of joints in various positions.	Student produces a plate that has smooth, straight, uniform beads that overlap, with no slag or craters present.	Student produces a plate that has minor imperfections in smoothness, straightness, or uniformity of the beads overlapping, with no slag or craters present.	Student produces a plate that has some imperfections in smoothness, straightness, or uniformity of the beads overlapping, with no slag or craters present.	Student produces a plate that has no evidence of smoothness, straightness, or uniformity and has poor overlapping, with slag and/or craters present.
Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.c: Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.	Student identifies three reasons for inconsistent results and explains both how to prevent and correct the poor results.	Student identifies two reasons for inconsistent results and explains both how to prevent and correct the poor results.	Student identifies one reason for inconsistent results and explains both how to prevent and correct the poor results.	Student cannot identify a reason for inconsistent results.
Health and Safety 6.5: Use tools and machines safely and appropriately.	Student demonstrates safe setup, use, and storage of equipment and keeps the working area clear and safe.		Student does not demonstrate safe setup, use, and storage of equipment or does not keep the working area clear and safe.	
Responsibility and Flexibility 7.6: Know how to apply high-quality craftsmanship to a product or presentation and continually refine and perfect it.	Student produces an end product that has smooth, straight, and uniform beads/welds that overlap/penetrate, with no slag or craters present.	Student produces an end product that has minor imperfections in smoothness, straightness, or uniformity of the beads/welds that overlap/penetrate, with no slag or craters present.	Student produces an end product that has some imperfections in smoothness, straightness, or uniformity of the beads/welds that overlap/penetrate, with no slag or craters present.	Student produces an end product that has no evidence of smoothness, straightness, or uniformity and has poor overlapping/penetration, with slag and/or craters present.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Agricultural Mechanics Pathway Occupations	
High school (diploma)	• Farm Equipment Operator • Farm Equipment Parts Person • Welder
Postsecondary training (certification and/or AA degree)	• Equipment Fabricator • Equipment Service Technician • Heavy Equipment Operator
College or university (bachelor's degree or higher)	• Agricultural Engineer • Irrigation Engineer • Agricultural Mechanics Teacher*

Agriscience

Sample sequence of courses in the Agriscience pathway:

CTE courses	Related courses
Introductory • Introduction to Agriculture	• Ornamental Horticulture • Animal Science • Chemistry • Physics • Earth Science • Environmental Science
Concentration • Agriscience • Agricultural Biology	
Capstone • Agricultural Business Management • Agricultural Biotechnology • Advanced Plant and Animal Science	

Sample of appropriate foundation and pathway standards for the Introduction to Agriculture course in the Agriscience pathway:

Foundation standards	**Academics 1.1 Algebra I (grades eight through twelve) 10.0:** Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.
	Communications 2.1 Reading Comprehension (grades nine and ten) 2.1: Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purposes.
	Technology 4.6: Differentiate among, select, and apply appropriate tools and technology.
	Health and Safety 6.4: Maintain safe and healthful working conditions.
	Health and Safety 6.5: Use tools and machines safely and appropriately.

Foundation standards	**Responsibility and Flexibility 7.3:** Understand the need to adapt to varied roles and responsibilities.
	Ethics and Legal Responsibilities 8.2: Understand the concept and application of ethical and legal behavior consistent with workplace standards.
	Leadership and Teamwork 9.2: Understand the ways in which preprofessional associations, such as the Future Farmers of America (FFA), and competitive career development activities enhance academic skills, promote career choices, and contribute to employability.
	Technical Knowledge and Skills 10.3: Understand the importance of maintaining and completing the California Agricultural Record Book.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway standards	**ANR C1.0:** Students understand the role of agriculture in the California economy.
	ANR C2.0: Students understand the interrelationship between agriculture and the environment.
	ANR C3.0: Students understand the effects of technology on agriculture.
	ANR C4.0: Students understand the importance of animals, the domestication of animals, and the role of animals in modern society.
	ANR C6.0: Students understand animal anatomy and systems.
	ANR C8.0: Students understand fundamental animal nutrition and feeding.
	ANR C9.0: Students understand basic animal health.
	ANR C11.0: Students understand plant growth and development.

Sample analysis ("unpacking") of a standard for the Introduction to Agriculture course in the Agriscience pathway:

Standard	**Agriculture and Natural Resources C9.0:** Students understand basic animal health.	
Standard subcomponent	**Agriculture and Natural Resources C9.5:** Understand the legal requirements for the procurement, storage, methods of application, and withdrawal times of animal medications and know proper equipment handling and disposal techniques.	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts*	*Benchmarks*
	1. Basic animal health requirements 2. Methods to keep animals healthy 3. How to identify active ingredients 4. How to identify species for which the medication is intended 5. How to identify which illness the medication treats or protects the animal from contracting	1. List four health requirements. 2. List four methods to keep animals healthy. 3. Locate active ingredients on label and name. 4. Locate intended species on label and name. 5. Locate illness on label and name.

What should students be able to do? At what level?	*Skills* 1. Locate, understand, and note proper medical information on a medication package. 2. Prepare a proper injection. 3. Inject a model. 4. Demonstrate proper equipment handling, storage, and disposal.	*Benchmarks* 1. Communicate name of medication, active ingredients, species, intended use, administration, dosage, withdrawal, storage, and special instructions. 2. Select correct needle and syringe size. Fill syringe and remove excess air. 3. Inject a model correctly with both subcutaneous and intramuscular injections. 4. List three storage methods for the medication and demonstrate how to dispose of the needle and syringe properly.
Topics and contexts **What must be taught?**	1. Basic animal health knowledge and vocabulary concepts 2. Basic packaging layout and content for medications 3. Withdrawal time requirements and ramifications for medications 4. Injection sites by species 5. Types of injections 6. How to prepare and give injections 7. Proper medicine storage 8. Proper disposal of medical tools and waste	

Sample Performance Task

Standards: This sample performance task targets the following Agriculture and Natural Resources industry sector foundation and Agriscience pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Algebra I (grades eight through twelve) 10.0	Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.
Foundation: Communications 2.1 Reading Comprehension (grades nine and ten) 2.1	Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purposes.
Foundation: Health and Safety 6.4	Maintain safe and healthful working conditions.
Foundation: Health and Safety 6.5	Use tools and machines safely and appropriately.
Foundation: Ethics and Legal Responsibilities 8.2	Understand the concept and application of ethical and legal behavior consistent with workplace standards.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway: ANR C9.5	Understand the legal requirements for the procurement, storage, methods of application, and withdrawal times of animal medications, and know proper equipment handling and disposal techniques.

Assignment: **Proper Injections and Medication Package Labels**

You will work in teams of two to prepare for and perform both a subcutaneous and intramuscular injection properly in a model (an orange). In addition, you will complete the medication package written quiz individually (ANR C9.5). You will perform the following:

1. For the injection task (Health and Safety 6.4; Health and Safety 6.5):
    a. Each team member will obtain a needle, a syringe, a bottle of simulated vaccine, an orange, a latex glove, and the directions sheet.
    b. Team Member A reads the direction orally while Team Member B performs the task. Member A checks off each step Member B completes. Students trade tasks on completion.
    c. Each student properly assembles, fills, and removes air bubbles in the syringe, practices their injections, and properly disposes of their sharps in the biohazard box.
    d. Teacher will verify the checklists and observe student behaviors.
2. For the quiz task:
    a. Read the labels provided and individually complete the questions requiring you to analyze three different samples of medication packages.
    b. Name the medication, active ingredients, labeled species, intended use, administration method, dosage, withdrawal, storage, and any special instructions (Academics 1.1 Algebra I [grades eight through twelve] 10.0; Communications 2.1 Reading Comprehension [grades nine and ten] 2.1; Ethics and Legal Responsibility 8.2).
    c. Calculate the proper dosage of each medication sample, given an animal's weight.
    d. Write a short paragraph about why it is important to follow the directions for withdrawal time as indicated on the medication package. Provide specific examples of negative ramifications of violating the withdrawal times.

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ANR C9.5: Understand the legal requirements for the procurement, storage, methods of application, and withdrawal times of animal medications and know proper equipment handling and disposal techniques.	Student can provide three examples about procurement, storage, methods of application, and withdrawal times. Student demonstrates proper handling and disposal techniques.	Student can provide two examples about procurement, storage, methods of application, and withdrawal times. Student demonstrates proper handling and disposal techniques.	Student can provide one example about procurement, storage, methods of application, and withdrawal times. Student demonstrates proper handling and disposal techniques.	Student can provide no examples about procurement, storage, methods of application, and withdrawal times. Student does not demonstrate proper handling and disposal techniques.

Standards	Advanced	Proficient	Basic	Unacceptable
Academics 1.1 Algebra I (grades eight through twelve) 10.0: Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.	Student makes proper dosage calculations after ascertaining the dosage rate and the animal weight.		Student does not make correct dosage calculations after ascertaining the dosage rate and the animal weight.	
Communications 2.1 Reading Comprehension (grades nine and ten) 2.1: Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purposes.	Student can locate information quickly on the medication package, explain why it is organized the way it is, and identify three key structure and format features on the label.	Student can locate information quickly on the medication package and explain why it is organized the way it is.	Student can locate information quickly on the medication package.	Student cannot locate pertinent information on the medication package.
Health and Safety 6.4: Maintain safe and healthful working conditions.	Student performs tasks in a safe manner.		Student does not perform tasks in a safe manner.	
Health and Safety 6.5: Use tools and machines safely and appropriately.	Student administers the injections and disposes of syringes and needles properly.		Student does not administer the injection and/or dispose of syringes and needles properly.	
Ethics and Legal Responsibility 8.2: Understand the concept and application of ethical and legal behavior consistent with workplace standards.	Student explains clearly why withdrawal time is important and gives examples.	Student explains clearly why withdrawal time is important.	Student explains minimally why withdrawal time is important.	Student cannot explain why withdrawal time is important.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Agriscience Pathway Occupations	
High school (diploma)	• Plant Propagator • Laboratory Aide • Laboratory Animal Caretaker
Postsecondary training (certification and/or AA degree)	• Food Processing Technician • Quality Assurance Specialist • Animal/Plant Laboratory Technician
College or university (bachelor's degree or higher)	• Biotechnology Specialist • Plant/Animal Geneticist • Agriculture Science Teacher*

Animal Science

Sample sequence of courses in the Animal Science pathway:

CTE courses	Related courses
Introductory • Introduction to Agriculture	• Agricultural Economics • Biology • Chemistry
Concentration • Animal Science • Agricultural Biology	
Capstone • Veterinary Technician • Agricultural Biotechnology • Animal and Plant Physiology	

Sample of appropriate foundation and pathway standards for the Animal Science course in the Animal Science pathway:

Foundation standards	**Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a:** Select and use appropriate tools and technology . . . to perform tests, collect data, analyze relationships, and display data.
	Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.d: Formulate explanations by using logic and evidence.
	Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.7: Use systematic strategies to organize and record information.

Foundation standards	**Health and Safety 6.4:** Maintain safe and healthful working conditions.
	Health and Safety 6.5: Use tools and machines safely and appropriately.
	Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**ANR D1.0:** Students understand the necessary elements for proper animal housing and animal-handling equipment.
	ANR D2.0: Students understand key principles of animal nutrition.
	ANR D3.0: Students understand animal physiology.
	ANR D4.0: Students understand animal reproduction, including the function of reproductive organs.
	ANR D5.0: Students understand animal inheritance and selection principles, including the structure and role of DNA.
	ANR D6.0: Students understand the causes and effects of diseases and illnesses in animals.
	ANR D8.0: Students understand the challenges associated with animal waste management.
	ANR D9.0: Students understand animal welfare concerns and management practices that support animal welfare.
	ANR D11.0: Students understand the production of specialty animals (e.g., fish, marine animals, llamas, tall flightless birds).
	ANR D12.0: Students understand how animal products and byproducts are processed and marketed.

Sample analysis ("unpacking") of a standard for the Animal Science course in the Animal Science pathway:

Standard	**Agriculture and Natural Resources D2.0:** Students understand key principles of animal nutrition.	
Standard subcomponent	**Agriculture and Natural Resources D2.3:** Understand the digestive processes of the ruminant, monogastric, avian, and equine digestive systems.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. The names of the four types of digestive systems 2. The names of the parts of the digestive systems 3. The order of the parts of the digestive systems 4. The function of each part of the digestive systems 5. The definitions of *osmosis* and *absorption* 6. Laboratory report write-up	*Benchmarks* 1. List all four types of digestive systems. 2. List all parts of all four systems. 3. List all the parts in proper sequence for all four systems. 4. List the function of all parts of all four systems. 5. Provide basic definitions. 6. List three required components of a laboratory report write-up.
What should students be able to do? At what level?	*Skills* 1. Explain osmosis and absorption and demonstrate the process. 2. Dissect and identify the parts of a digestive system. 3. Determine what kind of system is being dissected. 4. Describe the physical characteristics of the digestive tract contents at specific locations. 5. Explain the function of each part and the relationship of the structure to the function. 6. Examine rumen content under a microscope. 7. Write a laboratory report.	*Benchmarks* 1. Able to explain the concept and demonstrate one example 2. Able to examine and label parts from one system 3. Able to indicate which system is being examined 4. Able to provide a description of the contents at each specific location 5. Able to identify each part's function and at least one basic way the structure relates to the function 6. Able to describe three characteristics of the specimen 7. Able to include required components in the report
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–6 2. Identification of feed and appropriateness for each type of digestive system 3. Absorption and osmosis 4. Parts and functions of each system 5. Feed breakdown process 6. Location of each system in the animal body 7. Dissection techniques 8. Accurate measuring skills	

Sample Performance Task

Standards: This sample performance task targets the following Agriculture and Natural Resources industry sector foundation and Animal Science pathway standards:

Standard number	Standard
Foundation: Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a	Select and use appropriate tools and technology . . . to perform tests, collect data, analyze relationships, and display data.
Foundation: Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.d	Formulate explanations by using logic and evidence.
Foundation: Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.7	Use systematic strategies to organize and record information (e.g., anecdotal scripting, annotated bibliographies).
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway: ANR D2.3	Understand the digestive processes of the ruminant, monogastric, avian, and equine digestive systems.

Assignment: **Digestive Tract Dissection and Analysis**

You will conduct a digestive tract dissection and prepare a written laboratory report explaining the process and your findings (ANR D2.3; Demonstration and Application 11.0) as follows:

1. Work in teams of five, examining the digestive tract and determine the kind of system for your sample (Academics 1.2 Investigation and Experimentation [grades nine through twelve] 1.a; Leadership and Teamwork 9.3).
2. Describe the following characteristics for each part: size, length, feel, contents, and condition of contents (Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 1.7; Leadership and Teamwork 9.3).
3. Explain how each part functions and describe the relationship of the function to the structure of the part (Academics 1.2 Investigation and Experimentation [grades nine through twelve] 1.d).
4. Examine a sample of rumen contents under the microscope and describe your observations (Academics 1.2 Investigation and Experimentation [grades nine through twelve] 1.a; Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 1.7; Leadership and Teamwork 9.3).
5. Prepare a short written laboratory report that contains your findings. Conclude with an explanation of how the dissection laboratory helped you identify and understand the function of the digestive system (Academics 1.2 Investigation and Experimentation [grades nine through twelve] 1.d; Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 1.7; Leadership and Teamwork 9.3).

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ANR D2.3: Understand the digestive processes of the ruminant, monogastric, avian, and equine digestive systems.	Student describes kind, characteristics, and functions of various digestive systems. Student uses three or more descriptors to describe kind, characteristics, and functions of various digestive systems.	Student describes kind, characteristics, and functions of various digestive systems. Student uses two descriptors to describe kind, characteristics, and functions of various digestive systems.	Student describes kind, characteristics, and functions of various digestive systems in minimal detail. Student uses one descriptor to describe kind, characteristics, and functions of various digestive systems.	Student inadequately describes kind, characteristics, and functions of various digestive systems with missing and/or inaccurate detail.
Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.	Student selects and uses every dissection and measurement tool properly. Student compiles complete and accurate information on a data form.	Student selects and uses proper dissection and measurement tools. Student records information on a data form.	Student has minor difficulty in selecting and using some dissection and measurement tools. Records are minimal and/or inaccurate.	Student improperly and/or inadequately selects and uses dissection and measurement tools. Records are absent and/or inaccurate.
Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.d: Formulate explanations by using logic and evidence.	Student provides three or more descriptors for the function and design of digestive parts.	Student provides two descriptors for the function and design of digestive parts.	Student provides one descriptor for the function and design of digestive parts.	Student does not complete the descriptions, and/or explanations are incorrect.

Standards	Advanced	Proficient	Basic	Unacceptable
Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.7: Use systematic strategies to organize and record information (e.g., anecdotal scripting, annotated bibliographies).	Student arranges all information in an organized and efficient manner, with three or more supporting details.	Student arranges all information in an organized and efficient manner, with two supporting details.	Student arranges all information minimally in an organized and efficient manner, with one supporting detail.	Student does not organize or record information.
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.	Teacher observes student taking leadership in organizing group work and individual work effectively.	Teacher observes student helping to organize group work and structuring individual work effectively.	Teacher observes student following the group work plan and adequately structuring individual work.	Teacher observes student not following the group work plan or structuring individual work.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Animal Science Pathway Occupations	
High school (diploma)	• Farm and Ranch Assistant • Veterinary Hospital Assistant • Feed Store Clerk
Postsecondary training (certification and/or AA degree)	• Livestock Feed Sales • Breeding Technician* • Meat Inspector
College or university (bachelor's degree or higher)	• Veterinarian* • Processing Plant Manager • Animal Nutritionist

Forestry and Natural Resources

Sample sequence of courses in the Forestry and Natural Resources pathway:

CTE courses	Related courses
Introductory • Introduction to Agriculture	• Earth Science • Chemistry • Agricultural Mechanics • Environmental Science
Concentration • Agricultural Biology • Integrated Agriculture Science	
Capstone • Natural Resource Management • Forestry • Rural Recreation • Wildlife/Fisheries Management	

Sample of appropriate foundation and pathway standards for the Natural Resource Management course in the Forestry and Natural Resources pathway:

Foundation standards	**Academics 1.1 Geometry (grades eight through twelve) 11.0:** Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures.
	Academics 1.1 Probability and Statistics (grades eight through twelve) 8.0: Students organize and describe distributions of data by using a number of different methods, including frequency tables, histograms, standard line and bar graphs, stem-and-leaf displays, scatterplots, and box-and-whisker plots.
	Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.m: Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the finds.
	Academics 1.3 Principles of Economics (grade twelve) 12.2.2: Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.
	Communications 2.1 Reading Comprehension (grades nine and ten) 2.1: Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purposes.
	Communications 2.3 Written and Oral English Language Conventions (grades eleven and twelve) 1.1: Demonstrate control of grammar, diction, and paragraph and sentence structure and an understanding of English usage.
	Career Planning and Management 3.5: Understand the past, present, and future trends that affect careers, such as technological developments and societal trends, and the resulting need for lifelong learning.
	Problem Solving and Critical Thinking 5.3: Use critical thinking skills to make informed decisions and solve problems.
	Ethics and Legal Responsibilities 8.1: Know major local, district, state, and federal regulatory agencies and entities that affect the industry and how they enforce laws and regulations.

Foundation standards	**Technical Knowledge and Skills 10.1:** Understand the aims, purposes, history, and structure of the FFA student organization, and know the opportunities it makes available.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**ANR E1.0:** Students understand the importance of energy and energy cycles.
	ANR E2.0: Students understand air and water use, management practices, and conservation strategies.
	ANR E3.0: Students understand soil composition and soil management.
	ANR E4.0: Students understand rangeland management.
	ANR E5.0: Students understand wildlife management and habitat.
	ANR E6.0: Students understand aquatic resource use and management.
	ANR E7.0: Students understand the outdoor recreation industry.
	ANR E8.0: Students understand basic plant physiology, anatomy, and taxonomy.
	ANR E9.0: Students understand the role of fire in natural resource management.
	ANR E10.0: Students understand forest management practices.
	ANR E11.0: Students understand the basic concepts of measurement, surveying, and mapping.
	ANR E12.0: Students understand the use, processing, and marketing of products from natural resource industries.
	ANR E13.0: Students understand public and private land issues.

Sample analysis ("unpacking") of a standard for the Natural Resource Management course in the Forestry and Natural Resources pathway:

Standard	**Agriculture and Natural Resources E3.0:** Students understand soil composition and soil management.	
Standard subcomponent	**Agriculture and Natural Resources E3.1:** Understand the systems used to classify soils.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Characteristics and uses of soil types 2. How to read and interpret soil maps to make best use decisions 3. How the Land Judging contest is conducted and scored	*Benchmarks* 1. List four major characteristics and one use for each of eight soil types. 2. Cite four major categories detailed on a soil map and explain how each characteristic influences best-use decisions. 3. Explain and identify three major sections and components of each section.

What should students be able to do? At what level?	*Skills* 1. Determine the classification and type of soil samples, using the sand, silt, clay, and organic matter method. 2. Determine best practices for different locations on the basis of soil maps. 3. Evaluate a soil site, using the Land Judging scorecard.	*Benchmarks* 1. Examine and identify ten soil samples. 2. Evaluate and make decisions for three scenarios of medium complexity. 3. Evaluate and score one soil site.
Topics and contexts **What must be taught?**	1. Soil types 2. Parent materials and how they influence soils 3. Reading and interpreting soil maps 4. Land Judging contest and scorecard	

Sample Performance Task

Standards: This sample performance task targets the following Agriculture and Natural Resources industry sector foundation and Forestry and Natural Resources pathway standards:

Standard number	Standard
Foundation: Communications 2.1 Reading Comprehension (grades nine and ten) 2.1	Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purposes.
Foundation: Problem Solving and Critical Thinking 5.3	Use critical thinking skills to make informed decisions and solve problems.
Foundation: Technical Knowledge and Skills 10.1	Understand the aims, purposes, history, and structure of the FFA student organization, and know the opportunities it makes available.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: ANR E3.1	Understand the systems used to classify soils.

Assignment: **Soil Classification and Use**

You will work in teams of two to classify soil samples and make recommendations for land use (ANR E3.1; Demonstration and Application 11.0) as follows:

1. Obtain a soil sample and identify it by using the sand, silt, clay and organic matter method (ANR E3.1; Problem Solving 5.3).
2. Reveal the sample's point of origin and recommend best-use practices according to identification (Problem Solving 5.3).
3. Examine a soil map and identify structure and formatting characteristics and describe how the information layout is designed to help the reader locate information (Communications 2.1 Reading Comprehension [grades nine and ten] 2.1).

4. Make a recommendation for best uses for a scenario with a soil map reference. Include erosion, fertility, and risk of water contamination in your assessment (Communications 2.1 Reading Comprehension [grades nine and ten] 2.1; Problem Solving 5.3).
5. Identify the components evaluated in the three major sections (soil characteristics, qualities, use restrictions) of the Land Judging card and relate those components to your scenario assessment in a one-page word-processed narrative (Communications 2.1 Reading Comprehension [grades nine and ten] 2.1; Technical Knowledge and Skills 10.1).

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ANR E3.1: Understand the systems used to classify soils.	Student can cite four major characteristics and one use for each of eight soil types and accurately classify ten soil samples.	Student can cite four major characteristics and one use for each of eight soil types and accurately classify eight out of ten soil samples.	Student can cite four major characteristics and one use for each of eight soil types and accurately classify at least six out of ten soil samples.	Student can cite fewer than four major characteristics and one use for each of eight soil types and accurately classify fewer than six soil samples.
Communications 2.1 Reading Comprehension (grades nine and ten) 2.1: Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purposes.	Student can identify five layout and formatting characteristics of soil map design and describe how that design helps the reader locate information.	Student can identify four layout and formatting characteristics of soil map design and describe how that design helps the reader locate information.	Student can identify three layout and formatting characteristics of soil map design and describe how that design helps the reader locate information.	Student can describe fewer than three layout and formatting characteristics of soil map design and/or cannot describe how they assist the reader.
Problem Solving and Critical Thinking 5.3: Use critical thinking skills to make informed decisions and solve problems.	Student can examine and evaluate three different soil maps to make best use recommendations, with six or more supporting details.	Student can examine and evaluate three different soil maps to make best-use recommendations, with four or five supporting details.	Student can examine and evaluate three different soil maps to make best-use recommendations, with two or three supporting details.	Student can identify soil map components but cannot formulate appropriate best use recommendations.

Standards	Advanced	Proficient	Basic	Unacceptable
Technical Knowledge and Skills 10.1: Understand the aims, purposes, history, and structure of the FFA student organization, and know the opportunities it makes available.	Student can list three or more components from each of the three sections on the Land Judging card and can explain how the Land Judging contest is scored.	Student can list two components from each of the three sections on the Land Judging card and can explain how the Land Judging contest is scored.	Student can list one component from each of the three sections on the Land Judging card and can explain how the Land Judging contest is scored.	Student cannot identify any components or explain how the Land Judging contest is scored.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry.

Forestry and Natural Resources Pathway Occupations	
High school (diploma)	• Wilderness Firefighter • Soil Conservation Aide • Park Ranger Aide
Postsecondary training (certification and/or AA degree)	• Hunting Preserve Manager • Tree Farm Supervisor • Surveying Technician
College or university (bachelor's degree or higher)	• State Park Manager • Soil Conservationist • Aquatic/Game Biologist

Ornamental Horticulture

Sample sequence of courses in the Ornamental Horticulture pathway:

CTE courses	Related courses
Introductory • Introduction to Agriculture • Introduction to Ornamental Horticulture	• Agricultural Business Management • Chemistry • Drafting, CAD, CAM • Visual Arts • Geometry
Concentration • Agricultural Biology • Integrated Agriculture Science • Floriculture • Nursery/Greenhouse Production	
Capstone • Landscape Design and Maintenance • Advanced Ornamental Horticulture • Turf and Golf Management • Irrigation and Water Management	

Sample of appropriate foundation and pathway standards for the Introduction to Ornamental Horticulture course in the Ornamental Horticulture pathway:

Foundation standards	**Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a:** Select and use appropriate tools and technology . . . to perform tests, collect data, analyze relationships, and display data.
	Communications 2.2 Writing Strategies and Applications (grades nine and ten) 1.2: Use precise language, action verbs, sensory details, appropriate modifiers, and the active rather than the passive voice.
	Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 2.2: Deliver expository presentations: a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives. b. Convey information and ideas from primary and secondary sources accurately and coherently. c. Make distinctions between the relative value and significance of specific data, facts, and ideas. d. Include visual aids by employing appropriate technology to organize and display information on charts, maps, and graphs. e. Anticipate and address the listener's potential misunderstandings, biases, and expectations. f. Use technical terms and notations accurately.
	Health and Safety 6.5: Use tools and machines safely and appropriately.
	Responsibility and Flexibility 7.5: Understand the importance of time management to fulfill responsibilities.
	Technical Knowledge and Skills 10.2: Manage and actively engage in a career-related, supervised agricultural experience.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**ANR F1.0:** Students understand plant classification and use principles.
	ANR F2.0: Students understand plant physiology and growth principles.
	ANR F3.0: Students understand sexual and asexual plant reproduction.
	ANR F6.0: Students understand ornamental plant nutrition practices.
	ANR F9.0: Students understand the use of containers and horticultural tools, equipment, and facilities.

Sample analysis ("unpacking") of a standard for the Introduction to Ornamental Horticulture course in the Ornamental Horticulture pathway:

Standard	**Agriculture and Natural Resources F3.0:** Students understand sexual and asexual plant reproduction.	
Standard subcomponent	**Agriculture and Natural Resources F3.2:** Understand the various techniques for successful plant propagation (e.g., budding, grafting, cuttings, seeds).	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Seed physiology and germination process 2. Seed selection 3. Propagation techniques 4. Rooting hormone function and use 5. Cambium layer function	*Benchmarks* 1. Provide basic definitions. 2. Name three characteristics of quality seeds. 3. Name five propagation techniques. 4. Demonstrate proper use of rooting hormone and explain the function. 5. Identify the cambium layer in three stems and state the major function.
What should students be able to do? At what level?	*Skills* 1. Plant seeds properly. 2. Prepare stem cuttings properly. 3. Use tools safely and accurately.	*Benchmarks* 1. Select and plant three different kinds of seeds. 2. Prepare five different types of stem cuttings. 3. Demonstrate basic safety techniques and appropriate tool use.
Topics and contexts **What must be taught?**	1. Basic knowledge preceding concepts 1–3 2. Basic terminology 3. Methods and reasons for each of the different propagation techniques (budding, grafting, cuttings, seed planting, division) 4. Germination process 5. Rooting hormones 6. Cambium layer	

Sample Performance Task

Standards: This sample performance task targets the following Agriculture and Natural Resources industry sector foundation and Ornamental Horticulture pathway standards:

Standard number	Standard
Foundation: Health and Safety 6.5	Use tools and machines safely and appropriately.
Foundation: Responsibility and Flexibility 7.5	Understand the importance of time management to fulfill responsibilities.
Foundation: Technical Knowledge and Skills 10.2	Manage and actively engage in a career-related, supervised agricultural experience.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: ANR F3.2	Understand the various techniques for successful plant propagation (e.g., budding, grafting, cuttings, seeds).

Assignment: **Tip-Cutting Propagation Activity**

You will propagate a coleus plant through tip cuttings (ANR F3.2; Demonstration and Application 11.0) as follows:

1. Work individually for 30 minutes (Health and Safety 6.5; Responsibility and Flexibility 7.5) to:
   a. Select a mother plant.
   b. Select appropriate tools.
   c. Make five proper tip cuttings, each with two to four nodes or leaves, demonstrating appropriate and safe use of tools.
   d. Cut one-fourth inch below the fourth node.
   e. Remove the fourth leaf.
   f. Dip the cutting in root hormone.
   g. Place the cutting in the soil without covering the leaves.
   h. Prepare a label indicating the student's name, the plant's name, and the date.
   i. Water the cuttings and place the pot on a mist bed.
   j. Clean up your area.
2. Make entries in the calendar of operations for the supervised class cooperative agricultural experience (Technical Knowledge and Skills 10.2). You will:
   a. Note how the cuttings will be used for the cooperative supervised agricultural experience (SAE).
   b. Indicate data such as cost, variety and color propagated, rooting percentage, and growth records.

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ANR F3.2: Understand the various techniques for successful plant propagation (e.g., budding, grafting, cuttings, seeds).	Student expertly prepares five tip cuttings, plants them, waters the plants, and cleans up the workstation with no errors.	Student expertly prepares five tip cuttings, plants them, waters the plants, and cleans up the workstation with one error.	Student adequately prepares five tip cuttings, plants them, waters the plants, and cleans up the workstation with one error.	Student improperly prepares the tip cuttings and/or does not complete the process.
Health and Safety 6.5: Use tools and machines safely and appropriately.	Student uses the propagation tools properly.		Student uses propagation tools improperly or does not know how to use tools.	
Responsibility and Flexibility 7.5: Understand the importance of time management to fulfill responsibilities.	Student completes task within the given time frame.		Student does not complete task within the given time frame.	
Technical Knowledge and Skills 10.2: Manage and actively engage in a career-related, supervised agricultural experience.	Student makes regular, complete entries in the calendar of operations that include 95 percent or more of the SAE activities.	Student makes regular, complete entries in the calendar of operations that include at least 90 percent of the SAE activities.	Student makes regular, complete entries in the calendar of operations that include at least 85 percent of the SAE activities.	Student makes irregular and/or incomplete entries in the calendar of operations and/or includes less than 85 percent of the SAE activities.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Ornamental Horticulture Pathway Occupations	
High school (diploma)	• Nursery Sales Associate • Tree Trimmer and Pruner • Landscape Equipment Operator
Postsecondary training (certification and/or AA degree)	• Landscape Contractor* • Floral Designer • Garden Equipment and Supplies Dealer
College or university (bachelor's degree or higher)	• Greenhouse and Nursery Manager • Landscape Architect* • Entomologist

Plant and Soil Science

Sample sequence of courses in the Plant and Soil Science pathway:

CTE courses	Related courses
Introductory • Introduction to Agriculture	• Earth Science • Chemistry • Botany • Advanced Biology
Concentration • Agricultural Biology • Integrated Agriculture Science • Plant and Soil Science	
Capstone • Environmental Science • Crop Science • Viticulture • Agricultural Entomology and Pest Control	

Sample of appropriate foundation and pathway standards for the Environmental Science course in the Plant and Soil Science pathway:

Foundation standards	**Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.l:** Analyze situations and solve problems that require combining and applying concepts from more than one area of science.
	Communications 2.1 Reading Comprehension (grades eleven and twelve) 2.4: Make warranted and reasonable assertions about the author's arguments by using elements of the text to defend and clarify interpretations.
	Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.7: Use systematic strategies to organize and record information.
	Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 1.1: Formulate judgments about ideas under discussion and support those judgments with convincing evidence.
	Responsibility and Flexibility 7.4: Understand that individual actions can affect the larger community.
	Ethics and Legal Responsibilities 8.1: Know the major local, district, state, and federal regulatory agencies and entities that affect the industry and how they enforce laws and regulations.
	Leadership and Teamwork 9.5: Understand how to interact with others in ways that demonstrate respect for individual and cultural differences and for the attitudes and feelings of others.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts in the foundation and pathway standards.

Pathway standards	**ANR G1.0:** Students understand plant classification principles.
	ANR G3.0: Students understand plant physiology and growth principles.
	ANR G5.0: Students understand pest problems and management.
	ANR G6.0: Students understand soils and plant production.
	ANR G8.0: Students understand effective water management practices.
	ANR G9.0: Students understand the concept of an "agrosystem" approach to production.
	ANR G11.0: Students understand plant biotechnology.

Sample analysis ("unpacking") of a standard for the Environmental Science course in the Plant and Soil Science pathway:

Standard	**Agriculture and Natural Resources G1.0:** Students understand plant classification principles.	
Standard subcomponent	**Agriculture and Natural Resources G1.2:** Understand how to identify plants by using a dichotomous key.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Leaf classification 2. Flower type classification 3. Seasonality (e.g., perennial, annual, biennial) 4. Leaf characteristics 5. Use of the dichotomous key 6. Specimen collection and preservation 7. Proper channels for obtaining permission to collect specimens 8. Respect for the ecology of the collection fields	*Benchmarks* 1. Cite eight types of leaves. 2. Cite ten types of flowers. 3. Define *perennial, annual,* and *biennial* and give three examples of each. 4. List eight leaf characteristics. 5. Explain the dichotomous key and use it to identify ten plants. 6. Collect and preserve plants. 7. List one process for obtaining permission. 8. List three major ecology concerns to address.
What should students be able to do? At what level?	*Skills* 1. Identify visible features of plants. 2. Identify plants, using a dichotomous key. 3. Collect, press, mount, and preserve plants. 4. Ask for permission to collect. 5. Follow directions with regard to the ecology of the area.	*Benchmarks* 1. Identify four features. 2. Identify ten plants with dichotomous key. 3. Present 50 collected, pressed, mounted, and preserved plants. 4. Write a simple request to collect. 5. Follow the directions.
Topics and contexts **What must be taught?**	1. How to use a dichotomous key to classify and name specimens 2. How to collect, press, mount and preserve plants 3. Anatomical characteristics of plants 4. How to obtain permission to collect specimens 5. Fundamental ecological concerns and how to respect those conditions	

Sample Performance Task

Standards: This sample performance task targets the following Agriculture and Natural Resources industry sector foundation and Plant and Soil Science pathway standards:

Standard number	Standards
Foundation: Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.7	Use systematic strategies to organize and record information.
Foundation: Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 1.1	Formulate judgments about ideas under discussion and support those judgments with convincing evidence.
Foundation: Responsibility and Flexibility 7.4	Understand that individual actions can affect the larger community.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway: PSS G1.2	Understand how to identify plants by using a dichotomous key.

Assignment: **California Native Plant Collection**

In this assignment you will work individually to identify, mount, and display 50 California native plants, which you will carefully collect in accordance with the ecology of the collection areas (ANR G1.2; Responsibility and Flexibility 7.4; Demonstration and Application 11.0) as follows:

1. Obtain a dichotomous plant key.
2. Collect 50–75 plants from five different teacher-guided tours of species rich areas (e.g., grasses, trees, shrubs).
3. Take the collected plants back to the laboratory and press the samples.
4. Prepare and label correctly each specimen, including botanical name, common name, place collected (county and state), growth habits, dates, and collector's name (Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 1.7).
5. Prepare and mount each specimen correctly, using the appropriate techniques (lamination, bag, as is, trimming).
6. Organize the specimens according to classification (e.g., grasses, shrubs), bioregions, or other method of your identified choice.
7. Identify orally and correctly in the field a wide variety of California native plants.
8. Select five plants that could be used in habitat restoration and explain orally the choice and use to the teacher (Communications 2.4 Listening and Speaking Strategies and Applications [grades nine and ten] 1.1).

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ANR G1.2: Understand how to identify plants by using a dichotomous key.	Student can identify 70 native plants. Student can give examples of proper uses for 20 plants.	Student can identify 60 native plants. Student can give examples of proper uses for 15 plants.	Student can identify 50 native plants. Student can give examples of proper uses for ten plants.	Student can identify fewer than 50 native plants. Or student can give examples of proper uses for fewer than ten plants.
Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.7: Use systematic strategies to organize and record information.	Student labels plants in the field and then labels each specimen with all required information. Information is 95 percent accurate. Information is organized in an appropriate manner.	Student labels plants in the field and then labels each specimen with all required information. Information is 85 percent accurate. Information is organized in an appropriate manner.	Student labels plants in the field and then labels each specimen with all required information. Information is 75 percent accurate. Information is organized in an appropriate manner.	Student is missing required information. Or labels are less than 75 percent accurate. Or information is not organized in an acceptable manner.
Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 1.1: Formulate judgments about ideas under discussion and support those judgments with convincing evidence.	Student clearly articulates five logical plant choices, using strong evidence for selected uses. Presentation is logical and comprehensive.	Student articulates five logical plant choices and rationales in an organized manner.	Student's five plant choices are satisfactory, but rationales are weak or lacking clear logical explanation.	Student does not choose five appropriate plants for use. Or student cannot explain rationale for choices.
Responsibility and Flexibility 7.4: Understand that individual actions can affect the larger community.	Student explains how to obtain permission to collect specimens. Student properly collects and reports specimens.	Student respects the ecology of the collection areas. Student properly collects the specimens.	Student follows directions not to harm species or collect too many samples.	Student does damage to the ecology of the specimen collection areas.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Plant and Soil Science Pathway Occupations	
High school (diploma)	• Field Assistant • Crop Farmer • Insect Monitor/Collector
Postsecondary training (certification and/or AA degree)	• Tissue Culture Technician • Viticulturist • Field Representative
College or university (bachelor's degree or higher)	• Pest Control Advisor* • Integrated Pest Management Specialist • Agriculture Association Manager

Arts, Media, and Entertainment Industry Sector

The Arts, Media, and Entertainment industry sector is big business in California. This dynamic sector is relevant statewide, with most of the major employers concentrated in the southern part of the state. It offers jobs that require a vast range of creative and technical knowledge and skills. In a 2004 national study, almost 550,000 businesses employing almost three million people were involved in production and delivery in America's creative industries.[1] Flexibility and adaptability to a rapidly changing professional landscape are key elements to an individual's ultimate success in a career in arts, media, and entertainment. Consequently, most of the professions found in this sector require students to become familiar with information and skills across several different academic disciplines and career pathways as well as within their primary pathway.

The Media and Design Arts career pathway comprises a large number of industry occupations, such as user interface design, digital animation, print design, commercial photography, and cinematography. The Performing Arts pathway focuses on the direct creation of art and entertainment by individual artists and includes professional applications of theatre, dance, and music. And the Production and Managerial Arts pathway focuses on developing the organizational and managerial knowledge and skills needed to bring arts, media, and entertainment to the public as well as on training those who do the behind-the-scene jobs, such as set design, sound design, digital modeling, film editing, and camera work. For most of the skilled and semiskilled occupations in this industry sector, postsecondary education and training are expected.

Arts, Media, and Entertainment Industry Sector Pathways:

- Media and Design Arts
- Performing Arts
- Production and Managerial Arts

Media and Design Arts

Sample sequence of courses in the Media and Design Arts pathway:

CTE courses	Related courses
Introductory • Introduction to Design and Media Arts • Introduction to Digital Graphics • Film and New Media • Introduction to Design	• Entrepreneurship • Communication Systems • Product Design • Advanced-Placement Art History • Journalism
Concentration • Two-Dimensional Design • Animation • Internet Publishing • Filmmaking • Computer Graphics • Broadcast Journalism	
Capstone • Digital Animation • Three-Dimensional Modeling • Video Production • Cinematography • Computer Game Design • Technical Writing • Advertising Art	

Sample of appropriate foundation and pathway standards for the Animation course in the Media and Design Arts pathway:

Foundation standards	**Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.l:** Analyze situations and solve problems that require combining and applying concepts from more than one area of science.
	Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6: Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).
	Communications 2.4 Listening and Speaking Strategies and Applications (grades eleven and twelve) 1.10: Evaluate when to use different kinds of effects (e.g., visual, music, sound, graphics) to create effective productions.
	Technology 4.5: Know the key technological skills appropriate for occupations in the arts industry.
	Technology 4.7: Understand how technology can reinforce, enhance, or alter products and performances.
	Problem Solving and Critical Thinking 5.5: Understand the application of research and analysis skills to the creation of content.
	Responsibility and Flexibility 7.7: Develop a personal commitment to and apply high-quality craftsmanship to a product or presentation and continually refine and perfect it.

Foundation standards

Ethics and Legal Responsibilities 8.4: Adhere to the copyright and intellectual property laws and regulations, and use and cite proprietary information appropriately.

Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.

Leadership and Teamwork 9.7: Cultivate consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution.

Technical Knowledge and Skills 10.7: Understand and analyze the elements of the art form.

Technical Knowledge and Skills 10.8: Know key influences on the origin and evolution of art, technology, media, and performance (e.g., the influence of historical styles on contemporary idioms).

Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards

AME A1.0: Students master appropriate visual and performing arts (VPA) and English-language arts (ELA) content standards in relation to visual, aural, written, and electronic media projects and products.

AME A1.1: Specific applications of VPA Artistic Perception standards for Visual Arts at the advanced level (grades nine through twelve) 1.3: Analyze their works of art as to personal direction and style.

AME A1.2: Specific applications of VPA Creative Expression standards for Visual Arts at the proficient level (grades nine through twelve) 2.2: Prepare a portfolio of original two- and three-dimensional works of art that reflects refined craftsmanship and technical skills.

AME A1.2: Specific applications of VPA Creative Expression standards for Visual Arts at the advanced level (grades nine through twelve) 2.1: Create original works of art of increasing complexity and skill in a variety of media that reflect their feelings and points of view.

AME A1.2: Specific applications of VPA Creative Expression standards for Visual Arts at the advanced level (grades nine through twelve) 2.4: Demonstrate in their own works of art a personal style and an advanced proficiency in communicating an idea, theme, or emotion.

AME A1.3: Specific applications of VPA Historical and Cultural Context standards for Visual Arts at the advanced level (grades nine through twelve) 3.1: Identify contemporary styles and discuss the diverse social, economic, and political developments reflected in the works of art examined.

AME A1.3: Specific applications of VPA Historical and Cultural Context standards for Visual Arts at the advanced level (grades nine through twelve) 3.2: Identify contemporary artists worldwide who have achieved regional, national, or international recognition and discuss ways in which their work reflects, plays a role in, and influences present-day culture.

AME A1.4: Specific applications of VPA Creative Expression standards for Visual Arts at the proficient level (grades nine through twelve) 4.4: Articulate the process and rationale for refining and reworking one of their own works of art.

Pathway standards	**AME A1.4:** Specific applications of VPA Aesthetic Valuing standards for Visual Arts at the proficient level (grades nine through twelve) 4.5: Employ the conventions of art criticism in writing and speaking about works of art.
	AME A1.4: Specific applications of VPA Aesthetic Valuing standards for Visual Arts at the advanced level (grades nine through twelve) 4.1: Describe the relationship involving the art maker (artist), the making (process), the artwork (product), and the viewer.
	AME A2.1: Analyze the way in which technical design (e.g., color theory, lighting, graphics, typography, posters, sound, costumes, makeup) contributes to a performance or presentation.
	AME A2.2: Know the component steps and skills required to design, edit, and produce a production for audio, video, electronic, or printed presentation.
	AME A2.3: Use technology to create a variety of audio, visual, written, and electronic products and presentations.

Sample analysis ("unpacking") of a standard for the Animation course in the Media and Design Arts pathway:

Standard	**Arts, Media, and Entertainment A1.0:** Students master appropriate visual and performing arts (VPA) and English-language arts (ELA) content standards in relation to visual, aural, written, and electronic media projects and products.	
Standard subcomponent	**Arts, Media, and Entertainment A1.2:** Specific applications of VPA Creative Expression standards for Visual Arts at the advanced level (grades nine through twelve) 2.1: Create original works of art of increasing complexity and skill in a variety of media that reflect their feelings and points of view.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Understanding and acknowledging influences on point of view and feelings 2. Ways to create a strong personal style or message that carries feelings and point of view 3. The role of iteration and self- and peer analysis to improving artistic skill 4. The concept of artistic complexity	*Benchmarks* 1. Students give examples of how influences are reflected in the point of view in the work of two well-known artists and explain how influence is different from imitation. 2. Students give two examples of artists who created strong personal styles or brands reflecting feelings and point of view and cite three defining characteristics of their work. 3. Students explain an iterative process, together with examples from the industry, and discuss the role of feedback in increasing artistic skill. 4. Students can identify increasing artistic complexity in their own work and in the work of others.

What should students be able to do? At what level?	*Skills* 1. Explain clearly the reasoning and process behind their products. 2. Provide and respond to constructive criticism appropriately. 3. Use a variety of media competently.	*Benchmarks* 1. Students provide a clear, thoughtful one-page written explanation and critique for each of their own products. 2. Students write thoughtful one-paragraph reactions to the work of others, together with two concrete, constructive suggestions for improvement. 3. Students experiment with a variety of media and choose several in which to work further, thereby creating a portfolio of best work.
Topics and contexts **What must be taught?**	1. The understanding of the role of influence, innovation, and personal style in creating original artworks 2. The ways to analyze and improve work according to personal and other impressions and feedback 3. The importance and properties of the materials used in different media applications, including digital and multimedia	

Sample Performance Task

Standards: This sample performance task targets the following Arts, Media, and Entertainment industry sector foundation standards and Media and Design Arts pathway standards:

Standard number	Standards
Foundation: Communications 2.4 Listening and Speaking Strategies and Applications (grades eleven and twelve) 1.10	Evaluate when to use different kinds of effects (e.g., visual, music, sound, graphics) to create effective productions.
Foundation: Technology 4.7	Understand how technology can reinforce, enhance, or alter products and performances.
Foundation: Responsibility and Flexibility 7.7	Develop a personal commitment to and apply high-quality craftsmanship to a product or presentation and continually refine and perfect it.
Foundation: Ethics and Legal Responsibilities 8.4	Adhere to the copyright and intellectual property laws and regulations, and use and cite proprietary information appropriately.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: AME A1.2 Specific applications of VPA Creative Expression standards for Visual Arts at the advanced level (grades nine through twelve) 2.1	Create original works of art of increasing complexity and skill in a variety of media that reflect their feelings and points of view.

Standard number	Standards
Pathway: AME A1.4 Specific applications of VPA Aesthetic Valuing standards for Visual Arts at the proficient level (grades nine through twelve) 4.5	Employ the conventions of art criticism in writing and speaking about works of art.

Assignment: Brief Animation Sequence

In this assignment you will:

1. Will work in teams of two to prepare a brief (eight- to twelve-second) stop-motion animation sequence, using any of the materials and techniques (cutout animation, graphic animation, direct manipulation animation, object animation, puppet animation, clay animation) covered thus far in the course (Leadership and Teamwork 9.3). You will:
   a. Determine a concept for your production according to the time available for the project (Responsibility and Flexibility 7.7).
   b. Use a storyboard for the sequence, with at least one drawing for each second of the animation.
   c. Write a one- or two-paragraph description of your storyboard sequence, including the following:
      (1) Why you chose the medium
      (2) Why you chose the content
      (3) What your influences are (list two) and how you have reacted to or incorporated them into the project design (AME A1.2 Specific applications of VPA Creative Expression standards for Visual Arts at the advanced level [grades nine through twelve] 2.1; Ethics and Legal Responsibilities 8.4).
   d. Review each of your classmates' storyboard sequences during the classroom time provided for this activity and provide two concrete, constructive comments for each team's work (AME A1.4 Specific applications of VPA Aesthetic Valuing standards for Visual Arts at the proficient level [grades nine through twelve] 4.5).
   e. Review the comments on your own work and adjust your concept or design as needed to incorporate the feedback (Responsibility and Flexibility 7.7).
   f. Apply technique, materials, and tools appropriate to your given medium to produce the animation sequence in the time provided (AME A1.2 Specific applications of VPA Creative Expression standards for Visual Arts at the advanced level [grades nine through twelve] 2.1).
   g. Work together to film the final result. It should be compiled on the computer and include a title sequence and soundtrack, either musical or verbal (Communications 2.4 Listening and Speaking Strategies and Applications 1.10; Technology 4.7).
2. Write a report on your project that should include the following:
   a. Discussion of how the sequence was designed, including the information on medium, content, and influences that you developed for your storyboard description
   b. Discussion of how your team chose to respond to the feedback provided by classmates

c. Analysis of the creation and filming process, including any barriers encountered, the role of technology, and ideas for subsequent projects
d. Analysis of the final product, with discussion of original goals versus final achievement

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
AME A1.2: Specific applications of VPA Creative Expression standards for Visual Arts at the advanced level (grades nine through twelve) 2.1: Create original works of art of increasing complexity and skill in a variety of media that reflect feelings and points of view.	Medium, content, and presentation work well together to form a strong, seamless, and unique animation sequence. Artistic effort and skill are evident, and individual style or point of view is reflected for both team members.	Medium, content, and presentation work well together to form a smooth animation sequence. Artistic effort and skill are evident, and individual style or point of view is reflected for one team member.	Medium, content, and presentation work together, with some problematic areas, to form an animation sequence. Some elements of the sequence may be rough or choppy. One of the following three elements is not evident: artistic skill, personal effort, or individual style or point of view.	Medium, content, and presentation do not work well together. Sequence is rough or choppy. Or two or more of the following three elements are not evident: artistic skill, personal effort, or individual style or point of view.
MDA A1.4: Specific applications of VPA Aesthetic Valuing standards for Visual Arts at the proficient level (grades nine through twelve) 4.5: Employ the conventions of art criticism in writing and speaking about works of art.	Written report uses correct terminology and employs the conventions of art criticism accurately and incisively. Feedback on classmates' projects is substantive, constructive, and insightful.	Written report uses correct terminology and employs the conventions of art criticism accurately. Feedback on classmates' projects is substantive and constructive.	Written report uses correct terminology and employs the conventions of art criticism with some errors. Feedback on classmates' projects lacks clarity or constructiveness.	Written report contains significant errors in terminology or fails to use the conventions of art criticism correctly. Feedback is vague, not constructive, or incomplete.
Communications 2.4 Listening and Speaking Strategies and Applications (grades eleven and twelve) 1.10: Evaluate when to use different kinds of effects (e.g., visual, music, sound, graphics) to create effective productions.	Soundtrack is complete, well synched, and appropriate to the tone or content of the animation. The wording or musical choice is innovative and adds significant impact to the project.	Soundtrack is complete, well synched, and appropriate to the tone or content of the animation.	Soundtrack is complete but suffers from technical or aesthetic flaws which keep it from meshing well with the animation.	Soundtrack is incomplete or nonexistent.

Standards	Advanced	Proficient	Basic	Unacceptable
Technology 4.7: Understand how technology can reinforce, enhance, or alter products and performances.	Written report reflects on the use of technology and uses historical knowledge gained during the course to place the technologies used in context. Similarities and differences between the technology used and current trends in the field are noted.	Written report reflects on the use of technology in the product and discusses the ways in which the technology enhanced or complicated the process. A brief discussion of previous technologies is included.	Written report describes the ways technology was used in creating the product.	Written report does not discuss the use of technology.
Responsibility and Flexibility 7.7: Develop a personal commitment to and apply high-quality craftsmanship to a product or presentation and continually refine and perfect it.	Storyboards and animation sequence are carefully executed, with attention to detail. Written report explains in depth how concept and material were chosen and how feedback was used to improve the project.	Storyboards and animation sequence are well executed. Written report discusses the choice of concept and material and the use of feedback to improve the project.	Storyboards and animation sequence are sloppy or otherwise rough. Written report fails to discuss at least one of the following: the choice of concept and material or the use of feedback to improve the project.	Storyboards and animation sequence are incomplete. Or the written report does not discuss the choice of concept and material or the use of feedback to improve the project.
Ethics and Legal Responsibilities 8.4: Adhere to the copyright and intellectual property laws and regulations and use and cite proprietary information appropriately.	Written report names two or more influences and discusses how they influenced the project. Project is original and creative, and the use of the influences is likewise fresh and not derivative.	Written report names two influences and discusses how they influenced the project. Project is original but may reflect influences heavily.	Written report names two influences. Project may feel derivative but does not violate intellectual property laws.	Written report names fewer than two influences. Or project violates intellectual property laws.

Standards	Advanced	Proficient	Basic	Unacceptable
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.	Student works well with partner to set and meet timelines, organize materials, and complete assignments accurately before they are due.	Student sets and meets timelines, organizes materials, and completes assignments on time and with accuracy.	Student sets and meets timelines minimally, organizes materials, and completes assignments with some confusion.	Student struggles with teamwork, setting and meeting timelines, or organization. Or assignments are inaccurate.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry.

Media and Design Arts Pathway Occupations	
High school (diploma)	• Film Loader • Animation Assistant • Makeup Artist • Sign Painter
Postsecondary training (certification and/or AA degree)	• Videographer • Prop Maker • Cutter/Fitter/Seamstress • Special Effects Coordinator • Web Designer
College or university (bachelor's degree or higher)	• User Interface Designer • Sound Engineer • Medical and Scientific Illustrator • Scriptwriter • Media and Design Arts Instructor

Performing Arts

Sample sequence of courses in the Performing Arts pathway:

CTE courses	Related courses
Introductory • Introduction to Professional Dance	• Entrepreneurship • English Composition • Digital Audio Recording • Shakespeare • Psychology • Forensics/Debate • Physiology
Concentration • Professional Dance • Musical Notation • Instrument Tuning and Repair	
Capstone • Choreography • Professional Theatre • Professional Music Composition • Radio Announcing Apprenticeship	

Sample of appropriate foundation and pathway standards for the Professional Theatre course in the Performing Arts pathway:

Foundation standards

Communications 2.2 Writing Applications (grade eight) 2.5: Write documents related to career development, including simple business letters and job applications:

a. Present information purposefully and succinctly and meet the needs of the intended audience.
b. Follow the conventional format for the type of document (e.g., letter of inquiry, memorandum).

Communications 2.4 Listening and Speaking Applications (grades nine and ten) 2.3: Apply appropriate interviewing techniques:

a. Prepare and ask relevant questions.
b. Make notes of responses.
c. Use language that conveys maturity, sensitivity, and respect.
d. Respond correctly and effectively to questions.
e. Demonstrate knowledge of the subject or organization.
f. Compile and report responses.
g. Evaluate the effectiveness of the interview.

Communications 2.4 Listening and Speaking Strategies and Applications (grades eleven and twelve) 2.5: Recite poems, selections from speeches, or dramatic soliloquies with attention to performance details to achieve clarity, force, and aesthetic effect and to demonstrate an understanding of the meaning (e.g., Hamlet's soliloquy "To Be or Not to Be").

Career Planning and Management 3.0: Students understand how to make effective decisions, use career information, and manage personal career plans.

Problem Solving and Critical Thinking 5.4: Use the elements of the particular art form to observe, perceive, and respond.

Responsibility and Flexibility 7.5: Know the current issues and trends related to the field, distinguishing the different and convergent objectives that drive the industry.

Foundation standards	**Technical Knowledge and Skills 10.9:** Understand the economic basis of for-profit and not-for-profit performing arts organizational structures.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**AME B2.3:** Specific applications of VPA Creative Expression standards for Theatre at the proficient level (grades nine through twelve) 2.1: Make acting choices, using script analysis, character research, reflection, and revision through the rehearsal process.
	AME B2.3: Specific applications of VPA Creative Expression standards for Theatre at the advanced level (grades nine through twelve) 2.3: Work collaboratively as designer, producer, or actor to meet directorial goals in scenes and plays form a variety of contemporary and classical playwrights.
	AME B3.3: Specific applications of VPA Historical and Cultural Context standards for Theatre at the proficient level (grades nine through twelve) 3.3: Perform, design, or direct theatre pieces in specific theatrical styles, including classics by such playwrights as Sophocles, Shakespeare, Lope de Vega, Aphra Behn, Moliere, and Chekhov.
	AME B5.3: Specific applications of VPA Connections, Relationships, Applications standards for Theatre at the proficient level (grades nine through twelve) 5.1: Describe how skills acquired in theatre may be applied to other content areas and careers.
	AME B5.3: Specific applications of VPA Connections, Relationships, Applications standards for Theatre at the advanced level (grades nine through twelve) 5.4: Develop advanced or entry-level competencies for a career in an artistic or technical field in the theatre arts.
	AME B6.0: Students understand essential technical and technological requirements applicable to various segments of the Performing Arts pathway.
	AME B6.1: Understand the technical aspects of theatre (e.g., lights, sound, properties, costumes, makeup) from the perspective of the playwright and actor.
	AME B6.2: Analyze the physical, emotional, and social dimensions of characters found in dramatic texts from various genres and media.
	AME B6.3: Know various techniques and methods for theatrical, aural, and physical arts performances.
	AME B6.4: Understand how stage sets, costumes, lighting, musical instruments, props, and other effects support a performance.
	AME B6.5: Understand the differing roles of creators, performers, and others involved in the production and presentation of the performing arts.

Sample analysis ("unpacking") of a standard for the Professional Theater course in the Performing Arts pathway:

Standard	**Arts, Media, and Entertainment B6.0:** Students understand essential technical and technological requirements applicable to various segments of the Performing Arts Pathway.	
Standard subcomponent	**Arts, Media, and Entertainment B6.5:** Understand the differing roles of creators, performers, and others involved in the production and presentation of the performing arts.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Understand the roles of talent agents, casting directors, and producers and directors in the casting and contracting process. 2. Understand the role of trade and craft unions in the performing arts. 3. Know the variety of responsibilities and roles of the crew in preproduction, production, and postproduction of a performing arts presentation. 4. Understand the roles of producers and directors and how they affect creative control in a performing arts production. 5. Understand the role of the actor and how it relates to the roles of the crew and directors and producers. 6. Understand the role of marketing and distribution in performing arts productions. 7. Understand the differences in roles and terminology between for-profit and not-for-profit production companies and types of production (e.g., theatre, musical theatre, film, and television).	*Benchmarks* 1. Explain the casting, hiring, and contracting process. 2. Explain the influence of trade unions on the industry, citing at least two examples of different unions. 3. Identify the responsibilities of 20 key crew positions when provided with a list by the instructor. 4. Explain how the producer and director influence the creative direction of a production and cite two examples of producers or directors with strong personal styles. 5. Cite five interactions actors have with the crew and production team, including the director, and discuss ways in which the actors take direction concerning their performance. 6. Describe the role of marketing and distribution in performing arts productions and provide four examples of effective marketing and distribution. 7. List four differences between production processes for different types of theatre and two terminology differences.
What should students be able to do? At what level?	*Skills* 1. Visualize the hierarchies and relationships between all major roles in a theatre production. 2. Know the steps involved in a theatre production, from storyboarding to distribution.	*Benchmarks* 1. Design a flowchart that includes all the major roles and their relationships to one another for a specific type of company and production. 2. List the major steps involved in a specific type of theatre production, with at least two substeps cited for each.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–7 2. Analysis of artistic roles and relationships 3. Organizational principles of the performing arts 4. Work flow in the production process 5. Commercial aspects of the performing arts	

Sample Performance Task

Standards: This sample performance task targets the following Arts, Media, and Entertainment industry sector foundation and Performing Arts pathway standards:

Standard number	Standards
Foundation: Communications 2.2 Writing Applications (grade eight) 2.5	Write documents related to career development, including simple business letters and job applications. a. Present information purposefully and succinctly and meet the needs of the intended audience. b. Follow the conventional format for the type of document (e.g., letter of inquiry, memorandum).
Foundation: Communications 2.4 Listening and Speaking Applications (grades nine and ten) 2.3	Apply appropriate interviewing techniques: a. Prepare and ask relevant questions. b. Make notes of responses. c. Use language that conveys maturity, sensitivity, and respect. d. Respond correctly and effectively to questions. e. Demonstrate knowledge of the subject or organization. f. Compile and report responses. g. Evaluate the effectiveness of the interview.
Foundation: Career Planning and Management 3.1	Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers.
Foundation: Career Planning and Management 3.3	Develop a career plan that is designed to reflect career interests, pathways, and postsecondary options.
Foundation: Career Planning and Management 3.4	Understand the role and function of professional organizations, industry associations, and organized labor in a productive society.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: AME B6.5	Understand the differing roles of creators, performers, and others involved in the production and presentation of the performing arts.

Assignment: Choose one aspect of professional theatre based on your own interests and aptitudes and explore the requirements and strategies for successful entry into the industry as follows:

1. Consider your skills and interests and select a compatible aspect of professional theatre to explore (AME B6.5; Career Planning and Management 3.1).
2. Research the standard job-seeking process for your chosen aspect and then do the following:
   a. Create a "headshot" or résumé or cover letter or demonstration tape as dictated by the hiring conventions of the chosen aspect (Communications 2.2 Writing Applications [grade eight] 2.5).
   b. Research the guild, association, or union associated with your chosen aspect to determine the following:
      (1) Whether membership is required to secure work
      (2) What nonmonetary prerequisites are required for membership

(3) What fees are required to join and maintain membership
(4) Whether wages are negotiated for members through the organization
(5) What networking opportunities are available through the guild or association or union
(6) Whether the guild or association or union is centralized nationally or has local chapters (Career Planning and Management 3.3)

3. Find a person employed locally in your chosen aspect of professional theatre. The teacher may be able to help with this task. Direct calls to a local television station, local musical theatre troupe, local chapter of a guild or association or union, for example, may also produce results (Communications 2.4 Listening and Speaking Strategies and Applications [grades nine and ten] 2.3). You will:
   a. Arrange and conduct an informational interview with the individual. Personal interviews that will be weighted more heavily than those done by telephone.
   b. Transcribe the interview. Thorough notes are acceptable substitutes for direct transcription.

4. Write a report that includes the following:
   a. The rationale for choosing a particular aspect, with reference being made to personal aptitudes and comparisons with other aspects of professional theater
   b. A discussion of what was learned from the research and interview
   c. An outline of a comprehensive strategy for seeking future work in the chosen aspect of professional theatre (AME B6.5; Career Planning and Management 3.2)

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
AME B6.5: Understand the differing roles of creators, performers, and others involved in the production and presentation of the performing arts.	Student clearly demonstrates an understanding of the chosen aspect of professional theatre and its relationship to other aspects. Student is aware of the stated and implied requirements and expectations of employers for related positions.	Student clearly demonstrates an understanding of the chosen aspect of professional theatre. Student is aware of most requirements and expectations of employers for related positions.	Student demonstrates a basic understanding of the chosen aspect of professional theatre. Student is aware of some requirements and expectations of employers for related positions but is missing some elements of understanding.	Student does not understand the chosen aspect of professional theatre. Or student is not aware of requirements and expectations of employers for related positions.

Standards	Advanced	Proficient	Basic	Unacceptable
Communications 2.2 Writing Applications (grade eight) 2.5: Write documents related to career development, including simple business letters and job applications.	All necessary and suggested career search documents and materials are complete, including résumé and (where relevant) headshot and demonstration tape. Résumé or cover letter is clear, professional, free of errors, and well targeted to jobs in the chosen aspect of professional theatre.	All necessary career search documents are complete. Résumé or cover letter is clear, free of errors, and neatly formatted, thoroughly documenting relevant experience.	All necessary career search documents are complete. Résumé or cover letter may contain consistency, formatting, or spelling errors but reflects relevant experience.	One or more necessary career search documents are incomplete or missing. Résumé or cover letter is riddled with significant errors or does not reflect relevant experience.
Communications 2.4 Listening and Speaking Applications (grades nine and ten) 2.3: Apply appropriate interviewing techniques.	Student conducts an in-person interview and asks more than ten relevant questions of the interviewee. Student's notes are legible and provide a good record of questions asked and responses. Questions are well phrased, show evidence of research, and are designed to elicit useful information. The written report evaluates the effectiveness of the interview and summarizes information succinctly and clearly.	Student conducts an in-person or telephone interview and asks eight to ten relevant questions of the interviewee. Student's notes are legible and thoroughly record responses. Questions are well phrased and show evidence of research. The written report evaluates the effectiveness of the interview.	Student conducts an in-person or telephone interview and asks five to eight relevant questions of the interviewee. Student's notes are legible but incomplete or slapdash. Questions are not always well phrased, and some do not show evidence of research or elicit useful information. The written report evaluates the effectiveness of the interview.	Student conducts a telephone or e-mail interview and asks fewer than five questions or does not conduct an interview. Student's notes are illegible or extremely limited. Questions are poorly phrased and do not show evidence of research or elicit useful information. The written report does not sufficiently describe or evaluate the interview. Or the written report is incomplete or missing.

Standards	Advanced	Proficient	Basic	Unacceptable
Career Planning and Management 3.1: Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers.	Student chooses an aspect of professional theatre that is perfectly suited to his or her experience, interests, and aptitudes and explains the choice well, contrasting the choice with multiple examples of other aspects and showing why the aspect chosen is right for him or her.	Student chooses an aspect of professional theatre that is suited to his or her experience, interests, and aptitudes and explains the choice well.	Student chooses an aspect of professional theatre that is suited to his or her interests and explains the choice. The student may lack experience, knowledge, or skills in the chosen aspect or fails to explain fully why it was chosen.	Student does not explain why he or she chose the aspect of professional theatre.
Career Planning and Management 3.3: Develop a career plan that is designed to reflect career interests, pathways, and postsecondary options.	Report includes a career plan that is realistic and takes into account all the information gained through research and the interview. Plans for future professional development in the field are concrete and integrated with the career plan.	Report includes a career plan that is realistic and takes into account all the information gained through research and the interview.	Report includes a career plan that is somewhat realistic. Some gaps in understanding the career search process may be present, and/or the plan may fail to take into account some of the information gained through research and the interview.	Report does not include a realistic or well-informed career plan.
Career Planning and Management 3.4: Understand the role and function of professional organizations, industry associations, and organized labor in a productive society.	Research on industry guild, association, or union is thorough and answers accurately all of the questions listed in the assignment. Student shows an understanding of the role of craft unions and trade unions in the industry as a whole as well as in their chosen aspect.	Research on industry guild, association, or union is thorough and answers accurately all of the questions listed in the assignment.	Research on industry guild, association, or union answers accurately 80 percent of the questions listed in the assignment.	Research on industry guild, association, or union answers accurately less than 80 percent of the questions listed in the assignment.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry.

Performing Arts Pathway Occupations	
High school (diploma)	• Disc Jockey • Actor • Announcer • Voice-over Artist • Stunt Double
Postsecondary training (certification and/or AA degree)	• Actor • Music Minister • Radio/Television Broadcaster
College or university (bachelor's degree or higher)	• Musical Accompanist • Music Director/Conductor • Acoustician • Film Composer • Choreographer

Production and Managerial Arts

Sample sequence of courses in the Production and Managerial Arts pathway:

CTE courses	Related courses
Introductory • Introduction to Multimedia Production • Technical Theatre • Introduction to Sound Mixing	• Virtual Enterprise • Arts Management • Digital Audio Recording
Concentration • Broadcast Production • Set Design • Television Production	
Capstone • Stage Production Management • Filmmaking • Sound Engineering and Design	

Sample of appropriate foundation and pathway standards for the Television Production course in the Production and Managerial Arts pathway:

Foundation standards	**Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.3:** Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.
	Communications 2.4 Listening and Speaking Strategies and Applications (grades eleven and twelve) 1.1: Recognize strategies used by the media to inform, persuade, entertain, and transmit culture (e.g., advertisements; perpetuation of stereotypes; use of visual representations, special effects, language).

Foundation standards

Communications 2.4 Listening and Speaking Strategies and Applications (grades eleven and twelve) 1.3: Interpret and evaluate the various ways in which events are presented and information is communicated by visual image makers (e.g., graphic artists, documentary filmmakers, illustrators, news photographers).

Communications 2.4 Listening and Speaking Strategies and Applications (grades eleven and twelve) 1.14: Analyze the techniques used in media messages for a particular audience and evaluate their effectiveness (e.g., Orson Welles' radio broadcast "War of the Worlds").

Communications 2.4 Listening and Speaking Strategies and Applications (grades eleven and twelve) 2.4: Deliver multimedia presentations:

a. Combine text, images, and sound by incorporating information from a wide range of media, including films, newspapers, magazines, CD-ROMs, online information, television, videos, and electronic media-generated images.
b. Select an appropriate medium for each element of the presentation.
c. Use the selected media skillfully, editing appropriately and monitoring for quality.
d. Test the audience's response and revise the presentation accordingly.

Career Planning and Management 3.8: Understand the use of contracts in the arts industry and the principles and responsibilities of working as an independent contractor, including budgeting, project planning, advertising, and marketing strategies.

Technology 4.2: Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.

Ethics and Legal Responsibilities 8.5: Understand the ethical implications of the degree of influence media, arts, and performances have on individuals.

Ethics and Legal Responsibilities 8.6: Understand liability and compliance issues relevant to the arts, media, and entertainment industry.

Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.

Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards

AME C2.0: Students demonstrate important skills and an understanding of the complexities of production planning.

AME C2.2: Know how artistic processes, organizational structure, and business principles are interrelated in the various arts.

AME C2.3: Identify the activities and linkages from each stage associated with the preproduction, production, and postproduction of a creative project.

AME C2.4: Understand how the various aspects of story development contribute to the success or nonsuccess of an arts, media, and entertainment project or production.

AME C2.5: Apply knowledge of equipment and skills to determine the equipment, crew, technical support, and cast requirements for an arts, media, and entertainment production.

AME C3.0: Students understand the key elements of promoting a production.

Sample analysis ("unpacking") of a standard for the Television Production course in the Production and Managerial Arts pathway:

Standard	**Arts, Media, and Entertainment C2.0:** Students demonstrate important skills and an understanding of the complexities of production planning.	
Standard subcomponent	**Arts, Media, and Entertainment C2.4:** Understand how the various aspects of story development contribute to the success or nonsuccess of an arts, media, and entertainment project or production.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Genre and genre conventions 2. "Jumping the shark" and common writing pitfalls 3. The importance of the hook 4. Audience demographics and targeted program development 5. Nielsen ratings and how they are created.	*Benchmarks* 1. Name five popular television genres and define three conventions of one of them. 2. Give an example of a television show that "jumped the shark" and explain what happened to cause the problem. 3. Define *hook* and give two examples of good hooks. 4. List the four most coveted demographics and cite one story element that typically appeals to each. 5. Explain what a Nielsen rating is, how it is calculated, and what it means for a show's success or failure.
What should students be able to do? At what level?	*Skills* 1. Identify the relationship between story elements and the intended audience. 2. Analyze concepts and stories for appeal and marketability.	*Benchmarks* 1. Given a list of shows (with brief descriptions) and a list of demographic targets, match the shows accurately to their intended targets. 2. Shown two pilots, one that has become series and one that has not, identify the hook in both and provide two educated guesses as to why one was produced rather than the other.
Topics and contexts **What must be taught?**	1. Knowledge of preceding concepts 1–5 2. How to identify audience and market for a given concept 3. Elements of success stories	

Sample Performance Task

Standards: This sample performance task targets the following Arts, Media, and Entertainment industry sector foundation standards and Production and Managerial Arts pathway standards:

Standard number	Standards
Foundation: Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.3	Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: AME C3.1	Know the business aspects of the arts, media, and entertainment industry.
Pathway: AME C3.3	Know various media production, communication, and dissemination techniques and methods, including alternative ways to inform and entertain through written, oral, visual, and electronic media.

Assignment: Writing a Treatment

In this assignment you will:

1. Read the handout titled "Television Economics and Audience Demographics."
2. Select a recent television program (one airing within the past three years). Using observation and research on the Internet, write out the answers to the following questions on the provided work sheets (AME C3.1):
   a. What is the targeted audience for this program? Explain viewer demographics. Why are they so important to television producers?
   b. What marketing decisions (e.g., time slot, placement in lineup, seasonal airing schedule) increase a show's appeal to the target audience?
   c. What other elements (e.g., subject matter, gender, and age balance of characters) increase the show's appeal to the targeted audience?
   d. What other programs target this audience? Name three programs and discuss the key differences and similarities between those shows and your selection.
   e. What consumer products are aligned with this program (i.e., featured in commercial breaks)? Name three products advertised and discuss how they appeal to the same audience.
   f. What consumer products (if any) are tied into this program?
3. Read the article titled "Writing Effective Treatments for Television."
4. Work in groups of three to develop a concept for a pilot to be "pitched" to network executives. You will be randomly assigned a target demographic for this project. The concept needs to be unique and appeal to the assigned targeted demographic. Your work should result in a spot approximately 20 minutes long (to run in a half-hour slot,

with time allowed for commercial breaks) and be suitable for filming at the school with student actors (AME C3.3; Leadership and Teamwork 9.3; AME C3.1).

5. Create a "treatment" for your network executives, once you have developed your concept, that includes a brief descriptive outline of the show (in approximately five pages), including the following:
   a. Title
   b. Logline (a description of the overall idea of the story)
   c. Description of the target audience
   d. Description of the genre your show falls into
   e. Description of the elements of the show, including the essential appeal. *Why* do people want to watch this show? Where applicable, include the following:
      (1) What is your hook?
      (2) How do you establish the ambiance of the show?
      (3) Who are your characters? What is their situation?
      (4) How do you deal with setup and exposition (if necessary)?
      (5) What makes your show dramatic, funny, or informative? How?
      (6) What elements particularly appeal to your target audience?

The treatment should use appropriate industry vocabulary and should be clear, engaging, and interesting. The treatment that is chosen by the "executives" (your teacher and several others) will be registered with the Writers' Guild of America. Creating the pilot will become the class project for the semester (Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 1.3; Leadership and Teamwork 9.3).

Sample performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
AME C2.4: Understand how the various aspects of story development contribute to the success or nonsuccess of an arts, media, and entertainment project or production.	Concept for the show is innovative and uses genre conventions in new and exciting ways. Content is clearly targeted to the given demographic. Concept will fit within the time and filming parameters given.	Concept for the show is unique and does not duplicate any existing shows. Content is targeted to the given demographic. Concept will fit within the time and filming parameters given.	Concept for the show may rely heavily on genre conventions or resemble other successful shows, but it does not violate intellectual property laws. Content is targeted to the given demographic. Concept will fit within the time and filming parameters given after some initial revision.	Concept for the show is unoriginal or violates intellectual property laws. Or the content is not targeted to the given demographic. Or the concept will fit within the time and filming parameters given only after significant revision.

Standards	Advanced	Proficient	Basic	Unacceptable
AME C3.1: Know the business aspects of the arts, media, and entertainment industry.	Work sheet contains more than 90 percent correct answers, with clear explanations of terms and concepts that show depth of understanding. All examples listed are relevant.	Work sheet contains more than 80 percent correct answers, with adequate explanations of terms and concepts. All examples listed are relevant.	Work sheet contains more than 70 percent correct answers, with explanations of terms and concepts that may contain some errors. Most examples listed are relevant.	Work sheet contains less than 70 percent correct answers. Terms and concepts are not fully explained. Examples are insufficient or irrelevant.
Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.3: Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.	Treatment is persuasive and catchy, with a fresh and engaging style. All required information is included and thoroughly explained. Writing is professional, concise, and clear.	Treatment is interesting and persuasive. All required information is included. Writing is clear and concise.	Treatment explains concept well. Most required information is included, but some confusing areas or omissions exist. Writing is clear.	Treatment fails to explain concept. Or more than 40 percent of required information is missing or unclear. Or writing is unclear, insufficient, or confusing.
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.	Teacher observes student taking leadership in organizing group work and individual work effectively. Student participates actively in all aspects of concept and treatment development.	Teacher observes student helping to organize group work and structuring individual work effectively. Student participates in all aspects of concept and treatment development.	Teacher observes student following the group work plan and adequately structuring individual work. Student participates at a basic level in all aspects of concept and treatment development.	Teacher observes student not following the group work plan or structuring individual work. Or student does not participate in all aspects of concept and treatment development.

Note: Demonstration and Application 11.0 is included in all of the preceding entries.

Sample of pathway occupations: This sample of pathway occupations organized by level of education and training required for workforce entry.

Production and Managerial Arts Pathway Occupations	
High school (diploma)	• Third Assistant Director • Focus Puller • Camera Loader • Dolly Grip • Tape/Film Logger
Postsecondary training (certification and/or AA degree)	• First Assistant Camera Operator • Gaffer (Chief Lighting Technician) • Key Production Grip • Script Supervisor • Negative Cutter
College or university (bachelor's degree or higher)	• Producer • Line Producer • Sound Design Editor • Visual Effects Coordinator • Second Unit Director

Note

1. K. F. McCarthy and others, *Gifts of the Muse: Reframing the Debate About the Benefits of the Arts,* 2004. http://www.rand.org/pubs/monographs/2005/RAND_MG218.pdf

Building Trades and Construction Industry Sector

A strong demand for workers continues in the Building Trades and Construction industry sector, and that demand increases as populations, businesses, and local economies expand. According to the U.S. Bureau of Labor Statistics, construction is among the top ten of the nation's industries, constituting almost 5 percent of the total national gross domestic product. In California the long-term (2004–14) occupational projection for the Building trades and Construction Industry includes a need to fill 17,790 new jobs and provide 17,920 replacement workers as members of the current workforce retire or leave. In some trades in the state an increase of more than 30 percent in the number of available jobs is expected over the next ten years. Nationally, more than one million construction jobs will be created over the next decade, with job categories ranging from laborers to engineers to contractors.

In Building Trades and Construction industry sector classes, activities range from general or exploratory skills to job-specific skills that prepare students to select and pursue career paths through postsecondary training, work experience education, apprenticeships, and postsecondary education. The classes incorporate and apply academic core content to career-related education. These interdisciplinary approaches provide students with strong foundation skills and advanced skills in the career field of their choice, allowing students to exit programs and enter occupations directly or pursue further specialty training.

Building Trades and Construction Industry Sector Pathways:

- Cabinetmaking and Wood Products
- Engineering and Heavy Construction
- Mechanical Construction
- Residential and Commercial Construction

Cabinetmaking and Wood Products

Sample sequence of courses in the Cabinetmaking and Wood Products pathway:

CTE courses	Related courses
Introductory • Exploring Technology • Technology Core • Wood Technology	• Drafting • CADD • Orientation to Apprenticeship • Algebra • English Composition/ Writing
Concentration • Woodworking 1 • Woodworking 2	
Capstone • Cabinetmaking • Furniture Design	

Sample of appropriate foundation and pathway standards for the Wood Technology course in the Cabinetmaking and Wood Products pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.2:** Add subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take rational numbers to whole-number powers.
	Academics 1.1 Number Sense (grade seven) 1.3: Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
	Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.
	Career Planning and Management 3.1: Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers.
	Health and Safety 6.2: Understand critical elements of health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**BTC A1.0:** Students understand measurement systems in the planning and layout process used in the cabinetmaking and wood products industry.
	BTC A2.0: Students understand the safe and appropriate use of hand tools common to the cabinetmaking and wood products industry.
	BTC A3.0: Students understand the safe and appropriate use of portable power tools common to the cabinetmaking and wood products industry.
	BTC A4.0: Students understand the safe and appropriate use of stationary power tools common to the cabinetmaking and wood products industry.
	BTC A5.0: Students understand procedures and processes as they occur in the cabinetmaking and wood products industry.

Sample analysis ("unpacking") of a standard for the Wood Technology course in the Cabinetmaking and Wood Products pathway:

Standard	**Building Trades and Construction A2.0:** Students understand the safe and appropriate use of hand tools common to the cabinetmaking and wood products industry.	
Standard subcomponent	**Building Trades and Construction A2.1:** Use common hand tools and accessories, such as planers, shapers, clamping and gripping tools, pliers, wrenches, wood chisels, hammers, hand saws, and squares safely and properly.	
Course level	☒ Introductory ❑ Concentration ❑ Capstone	
What do students need to know? At what level?	*Concepts* 1. Know safety procedures and rules for use of hand tools. 2. Identify common hand tools. 3. Understand the appropriate use for each hand tool. 4. Understand procedures for each hand tool operation.	*Benchmarks* 1. Demonstrate all safety procedures and cite rules for using hand tools. 2. Identify ten common hand tools. 3. Choose the appropriate hand tool for a specified use. 4. Demonstrate proper use of hand tool for each cutting operation.
What should students be able to do? At what level?	*Skills* 1. Use of chisel to cut mortise joint and backsaw to cut mortise 2. Use of backsaw to cut length 3. Use of plane to square edge	*Benchmarks* 1. Fit mortise and tenon joints without movement in joint. 2. Make backsaw cut square and within 1/16 inch of desired length. 3. Use plane accurately to square edge and cut straight across length.
Topics and contexts **What must be taught?**	1. Basic hand tool safety 2. Basic hand tool use and operation	

Sample Performance Task

Standards: This sample performance task targets the following Building Trades and Construction industry sector foundation standards and Cabinetmaking and Wood Products pathway standards:

Standard number	Standards
Foundation: Health and Safety 6.2	Understand critical elements of health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: BTC A1.4	Know conventional measurement processes for cabinetmaking and wood products, linear measurements, and conversions of fractions and decimals.
Pathway: BTC A2.1	Use common hand tools and accessories, such as planers, clamping and gripping tools, pliers, wrenches, wood chisels, hammers, hand saws, and squares safely and properly.

Assignment: Make a wooden box, using only hand tools. Each corner of the box will have a different woodworking joint. Build the box according to the plan provided. But before you build the box, construct samples of the following woodworking joints: rabbet, dado joint, mortise and tenon, box or finger joint, dovetail joint, rabbet dado joint, miter joint, and butt joint. When you have completed each sample joint to the minimum quality, you will be allowed to start construction of your box (BTC A1.4; BTC A2.1; Health and Safety 6.2; Demonstration and Application 11.0).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
BTC A1.4: Know conventional measurement processes for cabinetmaking and wood products, linear measurements, and conversions of fractions and decimals. (20 points)	Proficient plus the following: 1. Measurements are within 1/32 inch of plan. 2. Student uses more than one method to determine square. (20 points)	1. Measurements are within 1/16 inch. 2. Dovetails space evenly within 1/16 inch. 3. Student uses tool to measure square. (15 points)	1. Measurements are within 1/8 inch. 2. Student knows what tools are needed to measure square and the definition of square. (10 points)	1. Measurements are not within 1/8 inch. 2. Student is not knowledgeable of the definition of square or its usage. (0 points)
BTC A2.1: Use common hand tools and accessories, such as planers, shapers, clamping and gripping tools, pliers, wrenches, wood chisels, hammers, handsaws, and squares, safely and properly. (70 points)	Proficient plus the following: 1. There are no visible gaps in all joints. 2. Box is square to within 1/32 inch. 3. Top is flush and operates easily. (70 points)	1 A different joint is used at every corner, with one joint a box joint or a dovetail joint. 2. Box is square to within 1/16 inch. 3. All gaps, holes, and defects are filled and sanded smooth. 4. Box lid opens without rubbing sides. (60 points)	1. There are large gaps at joints. 2. Box is not square to within 1/16 inch. 3. Same joint is used more than once in box. (50 points)	Project does not qualify for at least the basic score in the rubric and is not reworked to at least a basic level. (0 points)
Health and Safety 6.2: Understand critical elements of health and safety practices related to storing, cleaning and maintaining tools, equipment, and supplies. (10 points)	Proficient plus the following: 1. Student checks for sharpness safely. 2. Student stores and maintains sharp tools properly. 3. Student is cognizant of and applies health and safety practices pertaining to all hand tools. (10 points)	1. Student applies all basic safety rules for handling sharp-edged tools. 2. Student is able to clean and adjust plane. (9 points)	1. Student applies most basic safety rules for handling sharp-edged tools. (5 points)	1. Student does not apply basic safety rules. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Cabinetmaking and Wood Products Pathway Occupations	
High school (diploma)	• Cabinetmaking Apprentice* • Machine Operator
Postsecondary training (certification and/or AA degree)	• Cabinetmaking Journeyman* • CNC Technician • Furniture Maker • Production Manager
College or university (bachelor's degree or higher)	• Engineer • Designer • Cabinetmaking Instructor* • Construction Management

Engineering and Heavy Construction

Sample sequence of courses in Engineering and Heavy Construction pathway:

CTE courses	Related courses
Introductory • Exploring Technology • Technology Core	• CADD • Geometry • Drafting • Orientation to Apprenticeship
Concentration • Construction I • Wood I	
Capstone • Equipment Operator • Carpentry	

Sample of appropriate foundation and pathway standards for the Technology Core course in the Engineering and Heavy Construction pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.2:** Add subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take rational numbers to whole-number powers.
	Academics 1.1 Number Sense (grade seven) 1.3: Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
	Academics 1.1 Geometry (grades eight through twelve) 8.0: Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures.

Foundation standards	**Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 2.5:** Deliver persuasive arguments (including evaluation and analysis of problems and solutions and causes and effects): a. Structure ideas and arguments in a coherent, logical fashion. b. Use rhetorical devices to support assertions (e.g., by appeal to logic through reasoning; by appeal to emotion or ethical belief; by use of personal anecdote, case study, or analogy). c. Clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, expressions of commonly accepted beliefs, and logical reasoning. d. Anticipate and address the listener's concerns and counterarguments.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standard	**BTC B4.0:** Students understand project management procedures and processes as they occur in an engineering and heavy construction project.

Sample analysis ("unpacking") of a standard for the Technology Core course in the Engineering and Heavy Construction pathway:

Standard	**Building Trades and Construction B4.0:** Students understand project management procedures and processes as they occur in an engineering and heavy construction project.	
Standard subcomponent	**Building Trades and Construction B4.2:** Understand how to estimate the cost of supplies and materials for an engineering and heavy construction project.	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Foundation print reading 2. Volume and cost calculations 3. Cost of supplies and materials	*Benchmarks* 1. Demonstrate accurate reading of foundation dimensions. 2. Cite formulas for calculating volume and cost. 3. Calculate cost of materials for proposal or bid document.
What should students be able to do? At what level?	*Skills* 1. Determine sizes of foundation. 2. Perform basic volume and area calculations. 3. Determine costs for job completion.	*Benchmarks* 1. Measure correctly within 1 inch of specifications. 2. Calculate volume and area accurately for a simple project. 3. Calculate total costs of materials for proposal or bid document.
Topics and contexts **What must be taught?**	1. Basic volume and area calculations 2. Steps and procedures for slab construction 3. How to read a print	

Sample Performance Task

Standards: This sample performance task targets the following Building Trades and Construction industry sector foundation and Engineering and Heavy Construction pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Number Sense (grade seven) 1.3	Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
Foundation: Academics 1.1 Geometry (grades eight through twelve) 8.0	Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures.
Foundation: Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 2.5	Deliver persuasive arguments (including evaluation and analysis of problems and solutions and causes and effects): a. Structure ideas and arguments in a coherent, logical fashion. b. Use rhetorical devices to support assertions (e.g., by appeal to logic through reasoning; by appeal to emotion or ethical belief; by use of personal anecdote, case study, or analogy). c. Clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, expressions of commonly accepted beliefs, and logical reasoning. d. Anticipate and address the listener's concerns and counterarguments.
Pathway: BTC B4.2	Understand how to estimate the cost of supplies and materials for an engineering and heavy construction project.

Assignment: Calculate the cost of constructing a concrete slab and present a bid proposal to the class. Your calculations will include the following (BTC B4.2; Academics 1.1 Number Sense [grade seven] 1.3; Academics 1.1 Geometry [grades eight through twelve] 8.0):

1. Required concrete
2. Required rebar
3. Forming and set costs (formula)
4. Labor costs
5. Profit and overhead

Organize the data in a proposal form and make an oral presentation to your prospective customer (the class). You may include other options that would meet the specifications of the plans and design. The specification and dimensions will be found on the plan sheet. Document the entire process and show how you arrived at your calculations (BTC B4.2; Communications 2.4 Listening and Speaking Strategies and Applications [grades nine and ten] 2.5).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
BTC B4.2: Understand how to estimate the cost of supplies and materials for an engineering and heavy construction project. (50 points)	Estimate includes all of the required material and also includes options and costs for these options. (50 points)	Estimate includes all of the required materials. (40 points)	Estimate includes some of the required materials. (30 points)	Estimate includes less than 50 percent of the required materials or is incomplete or entirely absent. (0 points)
Academics 1.1 Number Sense (grade seven) 1.3: Convert fractions to decimals and percents and use these representations in estimations, computations, and applications. (15 points)	Measurements are correctly converted with appropriate, listed formulas, and the results are used in all calculations. (15 points)	Measurements are correctly converted with appropriate formulas, and the results are used in all calculations. (12 points)	Measurement conversions are not correctly performed, or incorrect formulas are listed or applied. (10 points)	Measurements are not converted. (0 points)
Academics 1.1 Geometry (grades eight through twelve) 8.0: Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures. (20 points)	Uses appropriate, listed formulas, and calculations are correctly performed and are within desired range. (20 points)	Uses appropriate formulas, and calculations are correctly performed and are within the desired range. (17 points)	Uses appropriate formulas, but there are errors in the calculations that are not within the appropriate range. (15 points)	Does not use appropriate formulas or calculations. (0 points)
Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 2.5: Deliver persuasive arguments (including evaluation and analysis of problems and solutions and causes and effects). (15 points)	Delivers speech with all details in a clear, coherent, and interesting fashion. (15 points)	Delivers speech with the most important details presented in a clear fashion. (10 points)	Delivers speech with limited detail and clarity. (5 points)	Speech cannot be understood. Or the details are not presented or are not correct. Or the student does not deliver the speech. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Engineering and Heavy Construction Pathway Occupations	
High school (diploma)	• Apprentice Engineer* • Laborer
Postsecondary training (certification and/or AA degree)	• Iron Worker • Heavy Construction Journeyman* • Electrician* • Plumber* • Contractor*
College or university (bachelor's degree or higher)	• Engineer • Business Owner • Engineering and Heavy Construction Instructor*

Mechanical Construction

Sample sequence of courses in the Mechanical Construction pathway:

CTE courses	Related courses
Introductory • Technology Core • Exploring Technology • Construction 1	• Drafting • Architectural Drawing • Orientation to Apprenticeship • Algebra • English Composition/Writing
Concentration • Construction 1 • Construction 2	
Capstone • Electrical Wiring • Building Construction • Plumbing	

Sample of appropriate foundation and pathway standards for the Construction 2 course in the Mechanical Construction pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.2:** Add subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take rational numbers to whole-number powers.
	Academics 1.1 Number Sense (grade seven) 1.3: Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
	Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.

Foundation standards	**Career Planning and Management 3.1:** Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers.
	Ethics and Legal Responsibilities 8.2: Understand the concept and application of ethical and legal behavior consistent with workplace standards.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway standards	**BTC C5.1:** Understand the safe use of electrical materials and electrical connections procedures.
	BTC C6.0: Students understand the variety of building phases, systems, and techniques used in mechanical construction.
	BTC C6.2: Students understand processes and materials appropriate to architectural design and mechanical construction (e.g., structural, electrical, mechanical, and finish phases).

Sample analysis ("unpacking") of a standard for the Construction 2 course in the Mechanical Construction pathway:

Standard	**Building Trades and Construction C6.0:** Students understand the variety of building phases, systems, and techniques used in mechanical construction.	
Standard subcomponent	**Building Trades and Construction C6.2:** Understand processes and materials appropriate to architectural and mechanical construction (e.g., structural, mechanical, and finish phases).	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. NEC code for outlet and switch wiring 2. Parts and purposes of electrical fixtures 3. Wire colors and purposes	*Benchmarks* 1. Cite NEC code for outlet and switch wiring. 2. Explain and describe parts and purposes of electrical fixtures. 3. Explain and describe purpose of color-coding electrical wires and list what color codes mean.
What should students be able to do? At what level?	*Skills* 1. Wire stripping 2. Connecting wires to terminals 3. Attaching devices to box	*Benchmarks* 1. Cite and demonstrate minimum NEC code requirements for wiring and stripping practices. 2. Connect wires to terminals properly in a gang box. 3. Attach devices to box in accordance with NEC code.
Topics and contexts **What must be taught?**	1. Wire colors and their meanings 2. Wire connections 3. How to wire basic circuits 4. Basic NEC code	

Sample Performance Task

Standards: This sample performance task targets the following Building Trades and Construction industry sector foundation and the Mechanical Construction pathway standards:

Standard number	Standards
Foundation: Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a	Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.
Foundation: Ethics and Responsibility 8.2	Understand the concept and application of ethical and legal behavior consistent with workplace standards.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway: BTC C6.2	Understand processes and materials appropriate to the architectural design and mechanical construction (e.g., structural, electrical, mechanical, and finish phases).

Assignment: Wire two basic electrical circuits—a duplex outlet and a switch loop. Use a wiring board with four 4-s metal boxes attached. From each box run nonmetallic sheathed cable to perform your wiring operations. From box 1 to box 2, wire a duplex outlet and attach it to the plaster ring on box 2. After the wiring has been inspected by the instructor, "pigtail" off box 2, keeping the outlet, and wire a switch in box 3 and a light fixture in box 4. With the teacher's permission connect the wiring to a power source and test the circuits, using a multimeter. *Note:* Do *not* practice wiring while the wiring board is connected to a power source (BTC C6.2; Academics 1.2 Investigation and Experimentation [grades nine through twelve] 1.a; Ethics and Responsibility 8.2).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
BTC 6.2: Understand processes and materials appropriate to architectural design and mechanical construction (e.g., structural, electrical, mechanical, and finish phases). (60 points)	Connects outlets, switch, and light fixture that are operational and exceed code requirements. Work can be used as an exemplar of high-quality workmanship. (60 points)	Connects outlets, switch, and light fixture that are operational and meet code requirements. (50 points)	Connects outlets, switch, and light fixture that are operational but do not meet code requirements. (40 points)	Connects outlets, switch, and light fixture in such a manner that they are unsafe or do not work and does not redo the work so that it meets basic standards. Or does not complete the work. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data. (10 points)	Uses a multimeter to measure multiple qualities and sets up the meter to correct scale and operation. (10 points)	Uses a multimeter to measure voltage. (5 points)	Cannot use the multimeter unsupervised. (2 points)	Does not know how to use a multimeter. (0 points)
Ethics and Legal Responsibilities 8.2: Understand the concept and application of ethical and legal behavior consistent with workplace standards. (30 points)	Knows there is a code, complies with the code in practice, and can state the code requirements for particular operations. (30 points)	Knows there is a code and complies with the code in practice. (25 points)	Knows there is a code but does not comply with the code in practice. (15 points)	Does not know there is a code or its requirements. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Mechanical Construction Pathway Occupations	
High school (diploma)	• Electrician's Helper • Mechanical Construction Apprentice*
Postsecondary training (certification and/or AA degree)	• HVAC Technician* • Mechanical Construction Journeyman * • Plumber* • Electrician*
College or university (bachelor's degree or higher)	• Engineer • Contractor* • Mechanical Construction Instructor*

Residential and Commercial Construction

Sample sequence of courses in the Residential and Commercial Construction pathway:

CTE courses	Related courses
Introductory • Exploring Technology • Construction 1 • Technology Core	• Drafting • Orientation to Apprenticeship • Algebra • English Composition/Writing
Concentration • Construction 2	
Capstone • Carpentry • Construction Technology	

Sample of appropriate foundation and pathway standards for the Carpentry course in the Residential and Commercial Construction pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.2:** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take rational numbers to whole-number powers.
	Academics 1.1 Number Sense (grade seven) 1.3: Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
	Academics 1.1 Geometry (grades eight through twelve) 8.0: Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures.
	Academics 1.1 Geometry (grades eight through twelve) 15.0: Students use the Pythagorean theorem to determine distance and find missing lengths of sides of right triangles.
	Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.
	Communications 2.3 Written and Oral English Language Conventions 1.4: Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
	Career Planning and Management 3.1: Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers.
	Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment goals.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards	
	BTC D1.0: Students understand measurement systems in the planning and layout process used in the residential construction industry.
	BTC D2.0: Students understand the safe and appropriate use of hand tools common to the residential and commercial construction industry.
	BTC D3.0: Students understand the safe and appropriate use of portable power tools that are common to the residential construction industry and are appropriate to the individual student's level.
	BTC D4.0: Students understand project management procedures and processes as they occur in a construction project.
	BTC D5.0: Students understand the value and necessity of practicing occupational safety in the construction facility and job site.
	BTC D6.0: Students understand the variety of building phases, systems, and techniques used in residential and commercial construction.

Sample analysis ("unpacking") of a standard for the Carpentry course in the Residential and Commercial Construction pathway:

Standard	**Building Trades and Construction D6.0:** Students understand the variety of building phases, systems, and techniques used in residential and commercial construction.	
Standard subcomponent	**Building Trades and Construction D6.2:** Understand the processes and materials (e.g., structural, electrical, mechanical, finish) appropriate to the architectural design and mechanical construction.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Structural parts of a simple gable roof 2. Understanding of the Pythagorean theorem to calculate rafter length 3. Layout of rafter cuts 4. Nailing requirements for roof assembly	*Benchmarks* 1. Identify all parts of a gable roof. 2. Apply the Pythagorean theorem in calculating length of rafters to within 1/8 inch of desired length. 3. Demonstrate the use of framing square and speed square to mark "bird's mouth" and ridge cut. 4. Recite nail requirements for roof assembly.
What should students be able to do? At what level?	*Skills* 1. Use of circular saw to make rafter cuts 2. Measuring and layout of rafters 3. Assembling roof parts	*Benchmarks* 1. Cut material within 1/16 inch to drawn lines for rafters. 2. Use a tape measure to measure and mark within 1/16 inch of desired length of rafters. 3. Assemble roof parts properly by nailing off ridge to rafters and toenail rafters to double top plate.
Topics and contexts **What must be taught?**	1. How to calculate rafter length, using a calculator and Pythagorean theorem 2. The parts of the roof structure 3. How to assemble roof parts	

Sample Performance Task

Standards: This sample performance task targets the following Building Trades and Construction industry sector foundation and Residential and Commercial Construction pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Geometry (grades eight through twelve) 15.0	Students use the Pythagorean theorem to determine distance and find missing lengths of sides of right triangles.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: BTC D6.2	Understand the process and materials (e.g., structural, electrical, mechanical, finish) appropriate to the architectural design and mechanical construction.

Assignment: Construct a roof structure for a wood frame building. Calculate the rafter length, using the Pythagorean theorem (Academics 1.1 Geometry [grades eight through twelve] 15.0), and use the calculations to lay out and cut the rafters. Use portable power tools to assemble the roof (BTC D6.2). Divide into work groups and assemble the structure according to the building code (BTC D6.2; Leadership and Teamwork 9.3).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
BTC D6.2: Understand the processes and materials (e.g., structural, electrical, mechanical, finish) appropriate to the architectural design and mechanical construction. (50 points)	Student knows the parts of the roof and required rafter cuts, measures accurately, and lays out cuts according to plans. Student cuts parts to 1/16 inch of specific length and assembles parts according to building code. (50 points)	Student knows the parts of the roof and the required rafter cuts, measures accurately, and lays out cuts according to plans. (40 points)	Student knows the parts of the roof structure. (10 points)	Student does not know the parts of the roof structure. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Academics 1.1 Geometry (grades eight through twelve) 15.0: Students use the Pythagorean theorem to determine distance and find missing lengths of sides of right triangles. (25 points)	Student calculates rafter length correctly, using the Pythagorean theorem, and converts the measurement from decimal feet to fractional measurement. (25 points)	Student calculates rafter length correctly in decimal feet, using the Pythagorean theorem. (20 points)	Student calculates rafter length incorrectly but still knows the Pythagorean theorem. (10 points)	Student cannot calculate at all and lacks any knowledge of the Pythagorean theorem. (0 points)
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals. (25 points)	Student assesses each worker's abilities and organizes groups according to skill levels to accomplish goal and complete task. (25 points)	Student organizes groups so that every worker contributes. The goal is accomplished, and the task is completed. (20 points)	Student organizes groups in a way which leads to limited participation from some workers and/or incomplete assembly. (15 points)	Student does not demonstrate any ability to organize groups or establish participation of workers. (10 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Residential and Commercial Construction Pathway Occupations	
High school (diploma)	• Heavy Equipment Operator • Laborer • Carpenter Apprentice*
Postsecondary training (certification and/or AA degree)	• Iron Worker • Welder* • Contractor* • Surveyor • Carpenter Journeyman*
College or university (bachelor's degree or higher)	• Engineer • Carpentry Instructor*

Education, Child Development, and Family Services Industry Sector

Education, Child Development, and Family Services is one of the fastest-growing industry sectors in the nation. It is projected to increase by nearly 40 percent by 2016, and a large number of employees in this sector will be retiring.[1] According to the U.S. Department of Labor, three of the ten fastest-growing segments of this industry sector are child care services; individual, family, community, and vocational rehabilitation services; and community and residential elder care services. And through 2012 another career in this sector, teaching, will continue be one of California's most vigorous areas of employment.

This industry sector includes four interrelated pathways: Child Development, Consumer Services, Education, and Family and Human Services. Each pathway includes a sequence of at least two rigorous courses, beginning with a foundation class that leads to one or more concentration classes and concluding with at least one capstone course. Through successful completion of a career pathway, students gain skills that enable them to enter the workforce at a higher-than-entry-level step. These courses prepare students to succeed in any of the careers related to the pathway.

Education, Child Development, and Family Services Industry Sector Pathways:

- Child Development
- Consumer Services
- Education
- Family and Human Services

Child Development

Sample sequence of courses in the Child Development pathway:

CTE courses	Related courses
Introductory • Home Economics Careers and Technology Comprehensive Core I • Home Economics Careers and Technology Comprehensive Core II	• Individual and Family Health • Foods and Nutrition • Careers in Education • Psychology • Speech
Concentration • Child Development and Guidance • Child Psychology	
Capstone • Careers in Child Development • Careers in Early Childhood Education	

Sample of appropriate foundation and pathway standards for the Careers in Early Childhood Education course in the Child Development pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.2:** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
	Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.d: Formulate explanations by using logic and evidence.
	Communications 2.3 Written and Oral English Language Conventions (grades nine and ten) 1.4: Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
	Leadership and Teamwork 9.0: Students understand effective leadership styles, key concepts of group dynamics, team and individual decision making, the benefits of workforce diversity, and conflict resolution.
	Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
	Technical Knowledge and Skills 10.17: Understand how knowledge, skills, attitudes, and behaviors learned in consumer and family studies can be transferred to advanced training and education or to careers related to the Education, Child Development, and Family Services sector.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**ECDFS A2.0:** Students understand and apply operational procedures and organizational policies at various child care and development facilities.
	ECDFS A3.0: Students understand child care and development standards, licensing, regulations, and codes.

Pathway standards	**ECDFS A5.0:** Students understand important elements of a child's physical, intellectual, emotional, and social growth and development.
	ECDFS A6.0: Students understand and apply the principles of positive interactions, guidance, and discipline in the workplace.
	ECDFS A7.0: Students understand and apply the essential components of an effective learning environment for the early childhood classroom.
	ECDFS A8.0: Students understand and apply developmentally appropriate practices for curriculum development.
	ECDFS A9.0: Students understand and apply the principles and practices of good nutrition, health, and safety for infants and children.
	ECDFS A11.0: Students understand the role of teaching materials and resources in enhancing classroom instruction in child care and development programs.

Sample analysis ("unpacking") of a standard for the Careers in Early Childhood Education course in the Child Development pathway:

Standard	**Education, Child Development, and Family Services A8.0:** Students understand and apply developmentally appropriate practices for curriculum development.	
Standard subcomponent	**Education, Child Development, and Family Services A8.2:** Plan and conduct activities that reinforce foundation skills, reflect an integrated and emergent curriculum, and support school readiness.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. The meaning of *emergent curriculum* 2. Foundation skills for children 3. The meaning of *integrated curriculum* 4. Components of school readiness 5. Components of a lesson plan	*Benchmarks* 1. Give the basic definition of *emergent curriculum* and a detailed example. 2. Cite three essential foundation skills and give examples. 3. Give the basic definition of *integrated curriculum* and a detailed example. 4. Give the basic definition of *school readiness* and list five components. 5. List five components of a lesson plan and describe each.
What should students be able to do? At what level?	*Skills* 1. Create a lesson plan. 2. Teach a lesson. 3. Assess a lesson. 4. Sequence lessons.	*Benchmarks* 1. Complete a basic lesson plan, using an approved template. 2. Present to a group of students an appropriate ten-minute lesson that achieves the learning objectives. 3. Select or design and administer an appropriate assessment, interpret the data, and respond appropriately to the results. 4. Give five examples of ways a given lesson can connect to another.

Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–5 2. Teaching methods and assessment strategies pertinent to the lesson 3. Components of and completion of a basic lesson plan, including objectives, setup procedures, follow-up activities, and questions to guide learning 4. Basic classroom presentation skills 5. Scope and sequence of lesson plans

Sample Performance Task

Standards: This sample performance task targets the following Education, Child Development, and Family Services industry sector foundation and Child Development pathway standards:

Standard number	Standards
Foundation: Communications 2.3 Written and Oral English Language Conventions (grades nine and ten) 1.4	Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: ECDFS A8.2	Plan and conduct activities that reinforce foundation skills, reflect an integrated and emergent curriculum, and support school readiness.

Assignment: The teacher will work with the cooperative learning group to select a concept or skill that will support a child's reading readiness for school, develop a lesson plan that includes an activity, and teach the lesson to the class. The teacher will:

1. Write out on a separate sheet the duties of each student in your cooperative learning group (Leadership and Teamwork 9.3).
2. Work with your cooperative learning group to:
   a. Choose a concept or skill to teach.
   b. Use the available resources (e.g., activity books, resources for teachers, children's storybooks) to select an activity that will teach the concept or skill (ECDFS A8.2).
   c. Describe the following items pertaining to the activity:
      (1) One to three objectives
      (2) Materials needed
      (3) The setup procedure
      (4) The directions you will give to the class (written in appropriate language and complete sentences)
      (5) Three questions to guide learning that you will ask the students as they perform the activity

(6) Two follow-up activities that may be taught on the following day, week, or unit (ECDFS A8.2; Communications 2.3 Written and Oral English Language Conventions [grades nine and ten] 1.4)

3. Teach the lesson to the class (ECDFS A8.2; Demonstration and Application 11.0) as follows:
   a. Introduce the lesson, relating the concept or skill to prior knowledge.
   b. Teach the lesson, using materials listed in the "materials needed" section.
   c. Check for understanding, using appropriate questions.
   d. Close the lesson.
   e. Relate this lesson to one in the future and mention one of the potential follow-up activities.
4. Write a 200-word reflective essay evaluating your part in the teaching process (Communications 2.3 Written and Oral English Language Conventions [grades nine and ten] 1.4). You are to include the following:
   a. A description of your part in teaching the lesson
   b. How the children responded
   c. What you did well
   d. What you learned
   e. What you would do differently the next time you teach a lesson

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
EDCFS A8.2: Plan and conduct activities that reinforce foundation skills, reflect an integrated and emergent curriculum, and support school readiness.	Lesson plan is complete, with one to three objectives, three questions to guide learning, and two follow-up activities. Lesson plan and activity selection demonstrate extensive awareness of school readiness skills and foundation skills. Lesson is taught with all the plan components included, and students in the class demonstrate improvement in achievement of the objectives.	Lesson plan is complete, with one to three objectives, three questions to guide learning, and two follow-up activities. Lesson plan and activity selection demonstrate awareness of school readiness skills or foundation skills. Lesson is taught with the plan components included, and students in the class demonstrate a minor increase in the achievement of the objectives.	Lesson plan is almost complete but may be missing an objective, one of the three questions, or one of the follow-up activities. The activity selected is not closely linked to school readiness or foundation skills. Lesson is taught with some of the plan components included, and students demonstrate limited achievement of the objectives.	Lesson is incomplete, lacking more than one of the identified components. Or the activity is inappropriate for the age or skill levels of the target group. Or the lesson plan is unworkable. Or the lesson plan is absent. The lesson plan is not followed during teaching, and the students being taught show no skill improvement or learning from the lesson.

Standards	Advanced	Proficient	Basic	Unacceptable
Communications 2.3 Written and Oral English Language Conventions (grades nine and ten) 1.4: Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.	Lesson plan and reflection are well written and comprehensible. Lesson plan and reflection contain no grammatical or spelling errors. Reflection is 300+ words.	Lesson plan and reflection are comprehensible. Lesson plan and comprehension contain a total of one to three grammatical and/or spelling errors. Reflection is 200–299 words.	Lesson plan and reflection are comprehensible. Lesson plan and reflection contain more than three grammatical and/or spelling errors. Reflection is fewer than 200 words.	Lesson plan or reflection is not comprehensible. Or lesson plan or reflection contains grammatical and spelling errors so extensive that they interfere with the reader's ability to understand the work.
Teamwork and Leadership 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.	Teacher observation and written plan show student taking leadership in organizing group work and structuring individual work effectively.	Teacher observation and written plan show student helping to organize group work and structuring individual work effectively.	Teacher observation and written plan show student following the group work plan and structuring individual work adequately.	Teacher observation shows student not following the group work plan or not structuring individual work.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Child Development Pathway Occupations	
High school (diploma)	• Child Care Provider • Preschool Aide • After-School Program Supervisor* • Family Child Care Supervisor • Infant Caregiver
Postsecondary training (certification and/or AA degree)	• Preschool Teacher* • Head Start Teacher* • Parent Educator • Teacher's Aide
College or university (bachelor's degree or higher)	• Children's Library Media Assistant Specialist* • Child Protection Social Worker* • Preschool Director* • School or Adoption Counselor* • Child Psychologist*

Consumer Services

Sample sequence of courses in the Consumer Services pathway:

CTE courses	Related courses
Introductory • Home Economics Careers and Technology Comprehensive Core I • Home Economics Careers and Technology Comprehensive Core II	• Careers in Education • Economics • Psychology • Marketing, Sales, and Service • Government
Concentration • Consumer Education • Economics for Living	
Capstone • Careers in Consumer Services • Consumer, Personal, and Financial Services	

Sample of appropriate foundation and pathway standards for the Careers in Consumer Services course in the Consumer Services pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.1:** Read, write, and compare rational numbers in scientific notation (positive and negative powers of ten) with approximate numbers, using scientific notation.
	Academics 1.3 Principles of Economics (grade twelve) 12.1: Students understand common economic terms and concepts and economic reasoning.
	Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6: Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).
	Leadership and Teamwork 9.2: Understand the ways in which preprofessional associations, such as FHA-HERO, and competitive career development activities enhance academic skills, promote career choices, and contribute to employability.
	Technical Knowledge and Skills 10.6: Understand the process of making consumer decisions, including the comparison of goods and services.
	Technical Knowledge and Skills 10.17: Understand how knowledge, skills, attitudes, and behaviors learned in consumer and family studies can be transferred to advanced training and education or to careers related to the Education, Child Development, and Family Services sector.
Pathway standards	**ECDFS B1.0:** Students understand important aspects of the consumer services industry and the role of the industry in state, local, and global economies.
	ECDFS B2.0: Students understand the principles of effective workforce and organizational management, including the roles and responsibilities of management and employees.
	ECDFS B4.0: Students understand essential consumer protection laws and regulations.

Pathway standards	**ECDFS B5.0:** Students understand consumer rights and responsibilities in the consumer services industry.
	ECDFS B6.0: Students understand the significance of national and international influences, current events, and diversity within the consumer services industry.
	ECDFS B7.0: Students understand customer relationships and their impact on businesses and employees in the consumer services industry.
	ECDFS B9.0: Students understand important consumer programs and services provided by energy, environmental, and resource management businesses.
	ECDFS B10.1: Understand the trends that affect customer demand for products and services.

Sample analysis ("unpacking") of a standard for the Careers in Consumer Services course in the Consumer Services pathway:

Standard	**Education, Child Development, and Family Services B5.0:** Students understand consumer rights and responsibilities in the consumer services industry.	
Standard subcomponent	**Education, Child Development, and Family Services B5.4:** Know effective strategies that consumers can use when exercising their rights and accepting their responsibilities.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Basic consumer rights and responsibilities 2. The Consumer Bill of Rights and Responsibilities 3. Ways in which consumers can exercise their rights 4. Ways in which consumers can meet their responsibilities	*Benchmarks* 1. Give the basic definition of *consumer rights and responsibilities.* 2. Cite all eight consumers' rights and three responsibilities and give examples. 3. Cite three ways in which consumers can exercise their rights and give examples. 4. Cite three ways in which consumers can meet their responsibilities and give examples.
What should students be able to do? At what level?	*Skills* 1. Exercise consumer rights. 2. Evaluate consumer purchases. 3. Resolve conflicts and issues related to the purchase process.	*Benchmarks* 1. Assess consumer products for safety, information, service, and environmental health. 2. Use critical thinking to evaluate consumer purchases from the perspective of rights and responsibilities. 3. Develop appropriate resolution strategies for issues of potential conflict related to purchasing.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–4 2. How knowledge of the Consumer Bill of Rights and Responsibilities is applied to consumer choices and purchases 3. Strategies to evaluate consumer choices in purchasing 4. Strategies for resolution and redress	

Sample Performance Task

Standards: This sample performance task targets the following Education, Child Development, and Family Services industry sector foundation standards and Consumer Services pathway standards:

Standard number	Standards
Foundation: Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6	Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).
Foundation: Leadership and Teamwork 9.2	Understand the ways in which preprofessional associations, such as FHA-HERO, and competitive career development activities enhance academic skills, promote career choices, and contribute to employability.
Pathway: ECDFS B5.0	Students understand consumer rights and responsibilities in the consumer services industry.
Pathway: ECDFS B5.4	Know effective strategies that consumers can use when exercising their rights and accepting their responsibilities.

Assignment: Working with a team to develop a presentation on the Consumer Bill of Rights and Responsibilities for the FHA-HERO Career Competition in Consumer Education, you will:

1. Create a survey to identify expectations and responsibilities consumers have regarding products and services (Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 1.6). Develop a minimum of ten questions. Survey a minimum of 30 consumers.
2. Record and analyze the results and key findings of the survey.
3. Select two products described in the survey and assess them for their safety, availability and quality of product information, service agreements, and potential concerns with environmental protection.
4. Develop a poster (standard size) illustrating the key findings of the study (Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 1.6).
5. Design an informative trifold brochure to educate others about each component of the Consumer Bill of Rights and Responsibilities. Use the information from the textbook and your research to provide concrete examples for the brochure (ECDFS B5.4).
6. Prepare a presentation to inform consumers about all eight components of the Consumer Bill of Rights and Responsibilities. Include information about the survey and product analyses to illustrate how consumers exercise or fail to exercise their rights and responsibilities (ECDFS B5.0).
7. Give the illustrated presentation at an FHA-HERO qualifying competition (Leadership and Teamwork 9.2).

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ECDFS B5.0: Students understand consumer rights and responsibilities in the consumer services industry.	Brochure and presentation thoroughly, clearly, and concisely address all eight consumer rights and responsibilities with multiple, extended examples from survey findings.	Brochure and presentation address each of the eight consumer rights and responsibilities. Survey findings relating to consumer rights and responsibilities are mentioned in the presentation.	Brochure and presentation address each of the eight consumer rights and responsibilities. Survey findings are not mentioned.	Brochure and/or presentation do not address each of the eight consumer rights and responsibilities. Survey findings are not mentioned.
ECDFS B5.4: Know effective strategies that consumers can use when exercising their rights and accepting their responsibilities.	Consumer rights strategies used to analyze consumer products for safety, information, service, and environmental protection are performed on at least two products and show validity and attention to detail. Brochure and presentation offer multiple strategies that are clearly defined, with multiple relevant examples for each consumer right and responsibility.	Consumer rights strategies used to analyze consumer products for safety, information, service, and environmental protection are performed on two products and show validity but lack attention to detail. Brochure and presentation give one effective strategy and example for each consumer right and responsibility.	Consumer rights strategies used to analyze consumer products for safety, information, service, and environmental protection are limited to one product and lack validity and attention to detail. Brochure and presentation offer a strategy and example for most of the consumer rights and responsibilities.	Consumer rights strategies used to analyze consumer products are not completed. Brochure and/or presentation lack effective strategies. Or examples are not offered for most of the rights and responsibilities.
Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6: Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).	Student creates an informative poster regarding survey on consumer decisions and experiences. Survey involves ten questions and a sample of 36 or more consumers.	Student creates an informative poster regarding survey on consumer decisions. Survey involves seven questions and a sample of 30–35 consumers.	Student creates an informative poster regarding survey on consumer decisions. Survey involves four questions and a sample of 20–29 consumers.	Student creates a poster that lacks survey information. Or student does not create a poster. Survey involves fewer than three questions for a sample of fewer than 20 consumers.

Standards	Advanced	Proficient	Basic	Unacceptable
	Questions are well phrased, not repetitive, thorough, and comprehensive.	Questions are well phrased, not repetitive, thorough, and comprehensive.	Most questions are well phrased, not repetitive, and comprehensive.	Most questions are phrased incorrectly, are repetitive, or are not comprehensive.
Leadership and Teamwork 9.2: Understand the ways in which preprofessional associations, such as FHA-HERO, and competitive career development activities enhance academic skills, promote career choices, and contribute to employability.	Student prepares and delivers a highly rated, comprehensive, and thorough consumer education presentation at the FHA-HERO qualifying competition.	Student prepares and presents consumer education event for qualifying competition, meeting all requirements.	Student's preparation and/or presentation of consumer education event for qualifying competition does not meet all requirements.	Student does not compete or is disqualified.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Consumer Services Pathway Occupations	
High school (diploma)	• Product Demonstrator • Customer Service Representative • Consumer Complaint Clerk • Display Clerk • Shipping and Receiving Clerk
Postsecondary training (certification and/or AA degree)	• Insurance Representative* • Property Manager • Consumer Credit Manager • Public Relations Representative • Consumer Products Tester
College or university (bachelor's degree or higher)	• Certified Financial Planner* • Consumer Affairs Director • Consumer Economist • Product and Development Researcher • Consumer Information Specialist

Education

Sample sequence of courses in the Education pathway:

CTE courses	Related courses
Introductory • Home Economics Careers and Technology Comprehensive Core I • Home Economics Careers and Technology Comprehensive Core II	• Individual and Family Health • Careers with Children • Food and Nutrition • Psychology • Speech
Concentration • Human Growth and Development • Psychological Development of Children	
Capstone • Careers in Education • Teaching Careers • Teaching and Learning	

Sample of appropriate foundation and pathway standards for the Careers in Education course in the Education pathway:

Foundation standards	**Communications 2.3 Written and Oral English Language Conventions (grades nine and ten) 1.2:** Understand sentence construction (e.g., parallel structure, subordination, proper placement of modifiers) and proper English usage (e.g., consistency of verb tenses).
	Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
	Technical Knowledge and Skills 10.3: Understand the importance of studying child growth and development from infancy through adolescence.
	Technical Knowledge and Skills 10.4: Understand positive guidance and discipline techniques that promote feelings of self-worth as they apply to the developmental stages of children.
	Technical Knowledge and Skills 10.5: Understand the value and methods of providing infants, children, and adolescents with play and developmentally appropriate learning activities.
	Technical Knowledge and Skills 10.12: Understand strategies and resources for managing conflicts and crises.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**ECDFS C2.1:** Know when and how to use correct procedures at the classroom level (e.g., attendance; observations; evaluations; illness, incident, accident, and injury reports).
	ECDFS C3.1: Know the critical health and safety procedures that are used at a school site.

Pathway standards	**ECDFS C5.4:** Know the best educational practices for the inclusion of children and adolescents with special needs.
	ECDFS C6.1: Understand common behavior problems, possible causes, and potential solutions.
	ECDFS C6.2: Understand strategies for effective classroom management, including appropriate discipline.
	ECDFS C6.3: Know the types of positive guidance techniques that are used in various stages of a child's development.
	ECDFS C6.4: Know how to support the development of a positive self-image and self-esteem as well as independence and respect for oneself and others.
	ECDFS C9.2: Understand issues of diversity and how to exhibit sensitivity to cultural differences.

Sample analysis ("unpacking") of a standard for the Careers in Education course in the Education pathway:

Standard	**Education, Child Development, and Family Services C6.0:** Students understand the roles of positive interaction, guidance, and discipline in the educational environment.	
Standard subcomponent	**Education, Child Development, and Family Services C6.2:** Understand strategies for effective classroom management, including appropriate discipline.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Elements of effective classroom management 2. Classroom routines and procedures 3. Classroom discipline 4. How classroom routines and procedures affect student discipline 5. How physical environments affect classroom discipline and behavior	*Benchmarks* 1. List ten examples of effective classroom management. 2. List and describe ten effective classroom routines and procedures. 3. Give a basic definition of *classroom discipline* and describe three examples of effective classroom discipline. 4. Give two examples of the relationship between specific classroom routines and procedures and student discipline. 5. Describe four characteristics of the ideal physical environment and tell why it prevents undesirable student behavior. Give examples of how other physical environments may affect classroom discipline and behavior.
What should students be able to do? At what level?	*Skills* 1. Observe and record the elements of an effective classroom. 2. Conduct basic classroom routines and procedures.	*Benchmarks* 1. Observe and record at least five aspects of the physical layout and teacher-student interaction in a classroom. 2. Demonstrate correctly at least two classroom routines and procedures (e.g., opening, group work, peer assistance, roll taking, lunch count).

	Skills	*Benchmarks*
What should students be able to do? At what level?	3. Know how to modify and design the physical layout of a classroom to create a positive learning environment.	3. Design and draw an ideal physical layout for an effective learning environment, including physical design, classroom rules and procedures, arrangement of furniture, grouping of students, and lighting.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–4 2. Age-appropriate key procedures and routines for the effective classroom 3. How to conduct an observation and techniques for recording observations 4. Determining the most effective physical layout for a classroom 5. Designing and drawing a physical layout	

Sample Performance Task

Standards: This performance task targets the following Education, Child Development, and Family Services industry sector foundation and Education pathway standards:

Standard number	Standards
Foundation: Communications 2.3 Written and Oral English Language Conventions (grades nine and ten) 1.2	Understand sentence construction (e.g., parallel structure, subordination, proper placement of modifiers) and proper English usage (e.g., consistency of verb tenses).
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: ECDFS C6.2	Understand strategies for effective classroom management, including appropriate discipline.

Assignment: In this assignment you will:

1. Use the textbook, the Internet, and other resources in your cooperative learning group to identify recommended classroom management strategies, including physical layout. Create a checklist of those recommendations (ECDFS C6.2; Communications 2.3 Written and Oral English Language Conventions [grades nine and ten] 1.2; Leadership and Teamwork 9.3).
2. Select a grade level to observe at the school where you intern. During your observation use the checklist to identify effective classroom management strategies. Add to the list any elements of an effective classroom environment that are not on the list, including physical layout, attractiveness, space arrangement, grouping of students, lighting, and other elements (ED C6.2; Communications 2.3 Written and Oral English Language Conventions [grades nine and ten] 1.2).
3. Discuss observations with your cooperative learning group and create "graffiti sheets" as the format for your discussion and report. At least eight findings should be reported.

Present and explain the graffiti sheets to the class, including effective classroom management strategies found in the literature that were not observed (ECDFS C6.2; Communications 2.3 Written and Oral English Language Conventions [grades nine and ten] 1.2; Leadership and Teamwork 9.3).

4. Conduct an informal survey with your cooperative learning group of at least five teachers. Ask them to (a) identify the classroom rules and procedures they consider the most important; and (b) discuss the eight most common discipline problems they encounter and their efforts to deal with those problems.
5. Create flash cards as a team. On one side of each card depict a discipline problem. On the other side of each card write the rules and procedures designed to help prevent the problem and effective discipline strategies to resolve it.
6. Present the flash cards to the other teams (Communications 2.3 Written and Oral English Language Conventions [grades nine and ten] 1.2; Leadership and Teamwork 9.3).
7. Design and draw, together with your cooperative learning group, the ideal physical layout for an effective learning environment. Include such strategies as physical design, classroom rules and procedures, furniture arrangement, attractiveness and lighting, and grouping of students.
8. Present the plan to the class and explain how the plan will result in a more effective learning environment (ECDFS C6.2; Communications 2.3 Written and Oral English Language Conventions [grades nine and ten] 1.2; Leadership and Teamwork 9.3).

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ECDFS C6.2: Understand strategies for effective classroom management, including appropriate discipline.	Graffiti sheets list 15 examples of effective classroom management. Flash cards accurately describe ten common discipline problems that are matched with appropriate rules and procedures that can prevent problems as well as strategies to resolve them.	Graffiti sheets list at least ten examples of effective classroom management. Flash cards describe eight common discipline problems that are matched with appropriate rules and procedures that can prevent problems as well as strategies to resolve them.	Graffiti sheets list at least six examples of effective classroom management. Flash cards describe five common discipline problems that are matched with rules and procedures that can prevent problems and/or strategies to resolve them.	Graffiti sheets list fewer than six examples of effective classroom management. Flash cards describe fewer than five discipline problems. Or flash cards do not describe discipline problems. Or problems are incorrectly matched with rules, procedures, and discipline strategies.

Standards	Advanced	Proficient	Basic	Unacceptable
	Plan for classroom management includes six or more strategies, including physical design, classroom rules and procedures, arrangement of furniture, grouping of students, attractiveness, and lighting.	Plan for classroom management includes five strategies, such as physical design, classroom rules and procedures, arrangement of furniture, grouping of students, attractiveness, and lighting.	Plan for classroom management includes four or more strategies, such as physical design, classroom rules and procedures, arrangement of furniture, grouping of students, attractiveness, and lighting.	Plan for classroom management does not include useful strategies and considers fewer than four elements of the physical environment. Or the student does not complete graffiti sheets or flash cards or does not plan.
Communications 2.3 Written and Oral English Language Conventions (grades nine and ten) 1.2: Understand sentence construction (e.g., parallel structure, subordination, proper placement of modifiers) and proper English usage (e.g., consistency of verb tenses).	All written work (including graffiti sheets, interview questions, flash cards, and plan for classroom management) is free of sentence construction errors and exhibits proper English usage.	Written work (including graffiti sheets, interview questions, flash cards, and plan for classroom management) has one to two errors in sentence construction and English usage.	Written work (including graffiti sheets, interview questions, flash cards, and plan for classroom management) has three to five errors in sentence construction and English usage.	Written work (including graffiti sheets, interview questions, flash cards, and plan for classroom management strategies) is incomplete or absent. Or written work has more than five errors in sentence construction and English usage. Or written work has English-usage errors of any number that cause significant confusion for the reader.
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.	Teacher observes student taking leadership in organizing group and structuring individual work effectively.	Teacher observes student helping to organize group work and structuring individual work effectively.	Teacher observes student following the group work plan and structuring individual work adequately.	Teacher observes student not following the group work plan or structuring individual work.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Education Pathway Occupations	
High school (diploma)	• Teacher's Aide • Tutor • After School Program Aide • Child Care Worker • Recreation Aide
Postsecondary training (certification and/or AA degree)	• Preschool Teacher • Preschool Director/Supervisor • Instructional Support Provider • Special Education Aide • Head Start Teacher
College or university (bachelor's degree or higher)	• Elementary, Secondary, or Postsecondary Teacher (Home Economics Careers and Technology)* • School Counselor* • Special Education Teacher* • School Administrator* • Speech and Language Therapist*

Family and Human Services

Sample sequence of courses in the Family and Human Services pathway:

CTE courses	Related courses
Introductory • Home Economics Careers and Technology Comprehensive Core I • Home Economics Careers and Technology Comprehensive Core II	• Child Development • Careers in Education • Psychology • Speech
Concentration • Family and Human Development • Individual and Family Health	
Capstone • Careers in Family and Human Services • Elder Care and Intergenerational Services	

Sample of appropriate foundation and pathway standards for the Careers in Family and Human Services course in the Family and Human Services pathway:

Foundation standards	**Academics 1.1 Mathematical Reasoning (grade seven) 1.1:** Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
	Communications 2.2 Writing Strategies and Applications (grades nine and ten) 1.5: Synthesize information from multiple sources and identify complexities and discrepancies in the information and the different perspectives found in each medium (e.g., almanacs, microfiche, news sources, in-depth field studies, speeches, journals, technical documents).
	Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 2.6: Deliver descriptive presentations: a. Establish clearly the speaker's point of view on the subject of the presentation. b. Establish clearly the speaker's relationship with that subject (e.g., dispassionate observation, personal involvement). c. Use effective, factual descriptions of appearance, concrete images, shifting perspectives and vantage points, and sensory details.
	Problem Solving and Critical Thinking 5.4: Apply decision-making skills to achieve balance in the multiple roles of personal, home, work, and community life.
	Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
	Technical Knowledge and Skills 10.12: Understand strategies and resources for managing conflicts and crises.
	Technical Knowledge and Skills 10.15: Understand the strategies that enable persons to manage and balance personal, family, and work responsibilities to enhance productivity and attain a quality of life.
Pathway standards	**ECDFS D8.0:** Students understand and apply interpersonal skills required to interact effectively with individuals and families.
	ECDFS D8.1: Know the strategies that promote positive interaction between individuals, families, and agencies.
	ECDFS D8.2: Understand effective ways to communicate and interact with culturally diverse individuals and families, such as using mediation, conflict resolution, and decision-making skills.
	ECDFS D8.3: Understand effective ways to teach individuals and families communication, mediation, conflict resolution, and decision-making skills.

Sample analysis ("unpacking") of a standard for the Careers in Family and Human Services course in the Family and Human Services pathway:

Standard	Education, Child Development, and Family Services D8.0: Students understand and apply interpersonal skills required to interact effectively with individuals and families.	
Standard subcomponent	Education, Child Development, and Family Services D8.2: Understand effective ways to communicate and interact with culturally diverse individuals and families, such as using mediation, conflict resolution, and decision-making skills.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Successful interpersonal skills 2. Strategies of effective teams 3. Conflict resolution strategies 4. Mediation	*Benchmarks* 1. Identify and describe ten positive interpersonal skills that are known to be effective in dealing with family members and team members. 2. Describe ten strategies that lead to effective teamwork. 3. Define *conflict,* identify three advantages and three disadvantages of conflict, and describe the five basic steps of conflict resolution. 4. Define *mediation* and describe two mediation strategies, types of mediation, and situations in which mediation is likely to be a useful strategy.
What should students be able to do? At what level?	*Skills* 1. Demonstrate effective interpersonal and teamwork skills. 2. Resolve conflicts successfully, using conflict resolution skills. 3. Resolve conflicts successfully, using mediation skills.	*Benchmarks* 1. Self-evaluate interpersonal skills and teamwork skills when working on team projects according to a provided rubric. 2. Resolve modeled conflicts appropriately by following the steps of conflict resolution. 3. Mediate a staged conflict between two parties to a mutually agreeable resolution, using the mediation process.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–4 2. How to create and work as part of an effective team 3. The importance of interpersonal skills when interacting with individuals and teams 4. Appropriate strategies to resolve conflict and mediate discussions	

Sample Performance Task

Standards: This sample performance task targets the following Education, Child Development, and Family Services industry sector foundation and Family and Human Services pathway standards:

Standard number	Standards
Foundation: Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 2.6	Deliver descriptive presentations: a. Establish clearly the speaker's point of view on the subject of the presentation. b. Establish clearly the speaker's relationship with that subject (e.g., dispassionate observation, personal involvement). c. Use effective, factual descriptions of appearance, concrete images, shifting perspectives and vantage points, and sensory details.
Foundation: Problem Solving and Critical Thinking 5.4	Apply decision-making skills to achieve balance in the multiple roles of personal, home, work, and community life.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
Pathway: ECDFS D8.2	Understand effective ways to communicate and interact with culturally diverse individuals and families, such as using mediation, conflict resolution, and decision-making skills.

Assignment: Working as a team with your cooperative learning group (Leadership and Teamwork 9.3), you will:

1. Use the textbook, the Internet, and other resources to research interpersonal and teamwork skills. As a team select the ten interpersonal and ten teamwork skills that you determine are most important. Be prepared to support your decisions with information from your research (ECDFS D8.2; Leadership and Teamwork 9.3).
2. Present your important skills lists in class and discuss them (ECDFS D8.2; Communications 2.4 Listening and Speaking Strategies and Applications [grades nine and ten] 2.6).
3. Prepare a checklist of essential interpersonal skills and teamwork skills. This checklist will be used by team members to assess their interpersonal skills and teamwork skills on future assignments (ECDFS D8.2).
4. *Note:* You are being given scenarios involving, interaction, conflict, and crisis. For each scenario identify the interpersonal and teamwork skills affecting the quality of the depicted relationships and/or work. Recommend ways to improve the interactions. Select two of the conflicts to role-play for the class. Discuss with the class what interpersonal and teamwork skills can be applied to help prevent or resolve the conflicts you portray (ECDFS D8.2; Communications 2.4 Listening and Speaking Strategies and Applications [grades nine and ten] 2.6; Problem Solving and Critical Thinking 5.4).
5. Evaluate your own interpersonal and teamwork skills as displayed during this assignment, using the checklist that your team developed. Include any skills used to prevent conflicts, mitigate conflicts, resolve conflicts, or mediate conflicts among team members (ECDFS D8.2; Leadership and Teamwork 9.3).

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ECDFS D8.2: Understand effective ways to communicate and interact with culturally diverse individuals and families, such as using mediation, conflict resolution, and decision-making skills.	Student displays extensive knowledge of communication, conflict resolution, and decision-making skills during all activities. Student uses multiple strategies to solve problems and advance work. All aspects of student's work show cultural sensitivity, taking into account how several cultures other than the student's own might approach decisions, scenarios, and problems.	Student displays knowledge of communication, conflict resolution, and decision-making skills during all activities. Student uses at least two strategies to solve problems and advance work. Most aspects of student's work show cultural sensitivity to at least one culture other than the student's own.	Student displays some knowledge of communication, conflict resolution, and decision-making skills during research, list selection, classwide discussion, checklist creation, scenario and role-play work, and personal evaluation. However, student's work does not demonstrate awareness of cultures other than his or her own.	Student's work indicates limited or no knowledge of communication, conflict resolution, and decision-making skills.
Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 2.6: Deliver descriptive presentations.	Student presents both the skills list and the role-playing scenarios. The presentations are clear, accurate, and factual and establish the speaker's point of view. Student takes the role-playing seriously. The presentation is an effective demonstration of at least one conflict resolution problem or strategy.	Student participates in at least one role-playing scenario. Student takes the role-playing seriously. The presentation is an effective demonstration of at least one conflict resolution problem or strategy.	Student participates in at least one role-playing scenario. Student invests only minimal effort in the role-playing or does not represent the role effectively. The presentation still functions as an effective demonstration of at least one conflict resolution problem or strategy.	Student does not represent the team in any of the role-playing scenarios. Or student does not know the role. Or student does not take the role-playing seriously. Or student disrupts or undermines the role playing, obscuring the presentation's point.
Problem Solving and Critical Thinking 5.4: Apply decision-making skills to achieve balance in the multiple roles of personal, home, work, and community life.	Student uses decision-making and problem-solving skills extensively in mediation scenarios to help others recognize different points of view and find resolution.	Student uses decision-making and problem-solving skills at key points in mediation scenarios to help others recognize different points of view and find resolution.	Student uses decision-making and problem-solving skills minimally in mediation scenarios to help others recognize different points of view and find resolution.	Student does not use decision-making and problem-solving skills in mediation scenarios to help others recognize different points of view and find resolution.

Standards	Advanced	Proficient	Basic	Unacceptable
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.	Teacher observes student taking leadership in organizing group and structuring individual work effectively. Throughout the assignment student applies communication, decision-making, and conflict-resolution skills to work well as a team member and to achieve team and task goals.	Teacher observes student helping to organize group work and structuring individual work effectively. Student applies communication, decision-making, and conflict-resolution skills to work well as a team member and to achieve team and task goals.	Teacher observes student following the group work plan and adequately structuring individual work. Student applies some communication, decision-making, and conflict-resolution skills to work well as a team member and to achieve team and task goals.	Teacher observes student not following the group work plan or structuring individual work. Student does not apply communication, decision-making, and conflict-resolution skills to work well as a team member and to achieve team and task goals.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Family and Human Services Pathway Occupations	
High school (diploma)	• Residential Care Aide • Adult Day Care Worker • Homemaker's Aide • Elder Care Worker • Personal/Home Care Aide
Postsecondary training (certification and/or AA degree)	• Certified Activities Director* • Social Services Technician Aide • Community Worker • Special Needs Case Worker
College or university (bachelor's degree or higher)	• Elder Care Coordinator • Residential Care Facility Administrator • Community Organization Director • Family Advocate • Group Home Administrator

Note

1. Bureau of Labor Statistics, *U.S. Occupational Outlook Handbook: Tomorrow's Jobs*. Washington, D.C.: U.S. Department of Labor, 2006. http://www.bls.gov/oco

Energy and Utilities Industry Sector

Because the Energy and Utilities industry sector consists of many different companies and products, skills developed in one segment may be transferable to other segments. The career pathways in this sector emphasize real-world, occupationally relevant experiences of significant scope and depth in Electromechanical Installation and Maintenance, Energy and Environmental Technology, Public Utilities, and Residential and Commercial Energy and Utilities. Students with skills in specific segments will be prepared to enter local, state, and national employment markets. This sector's career pathways provide career opportunities for persons with varying levels of experience and education, and the sector is forecast to experience significant growth in employment over the next decade, particularly in jobs related to water and sewage systems.[1] In addition, production workers' earnings are significantly higher than those in most other industries. To prepare students for the vast range of job opportunities, middle schools, high schools, regional occupational centers and programs, community colleges, and four-year colleges and universities provide education and training programs in energy and utilities.

The Electromechanical Installation and Maintenance pathway provides learning opportunities for students interested in working in production, installation, maintenance, and repair. In this pathway students learn how to maintain and repair pipelines and power lines, operate and repair plant machinery, and monitor treatment processes. The Energy and Environmental Technology pathway provides learning experiences for students interested in energy production and environmental concerns. They learn how to install, repair, and maintain power-generating stations, gas plants, water treatment plants, and wet-sewage treatment plants. The Public Utilities pathway provides learning opportunities for students interested in working toward employment or advanced training in a variety of public utility industries, including but not limited to power plant operation, power distribution and dispatching, and operation of water treatment plants or wastewater plants. The Residential and Commercial Energy and Utilities pathway provides learning opportunities for obtaining, verifying, and maintaining primary financial data and records, including recording the usage of electricity, gas, water, and sewer utilities.

Energy and Utilities Industry Sector Pathways:

- Electromechanical Installation and Maintenance
- Energy and Environmental Technology
- Public Utilities
- Residential and Commercial Energy and Utilities

Electromechanical Installation and Maintenance

Sample sequence of courses in the Electromechanical Installation and Maintenance pathway:

CTE courses	Related courses
Introductory • Exploring Technology • Technology Core	• Algebra • Geometry • English Composition/Writing • Physics • Orientation to Apprenticeship
Concentration • Drafting • Consumer Electronics • Computer Applications	
Capstone • CAD/CAM • Technical Writing • A+ Certification	

Sample of appropriate foundation and pathway standards for the Technology Core course in the Electromechanical Installation and Maintenance pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.1:** Read, write, and compare rational numbers in scientific notation (positive and negative powers of ten) with approximate numbers, using scientific notation.
	Academics 1.1 Algebra II (grades eight through twelve) 6.0: Students add, subtract, multiply, and divide complex numbers.
	Academics 1.2 Physics (grades nine through twelve) 3.a: Students know heat flow and work are two forms of energy transfer between systems.
	Academics 1.2 Physics (grades nine through twelve) 5.a: Students know how to predict the voltage or current in simple direct current (DC) electrical circuits constructed from batteries, wires, resistors, and capacitors.
	Communications 2.1 Reading Comprehension (grades nine and ten) 2.1: Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purpose.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**EU A2.0:** Students understand energy conversion processes and energy transmission systems used in the electromechanical installation and maintenance industry.
	EU A2.5: Know the fundamentals of basic electrical supply components.

Sample analysis ("unpacking") of a standard for the Technology Core course in the Electromechanical Installation and Maintenance pathway:

Standard	**Energy and Utilities A2.0:** Students understand energy conversion processes and energy transmission systems used in the electromechanical installation and maintenance industry.	
Standard subcomponent	**Energy and Utilities A2.5:** Know the fundamentals of basic electrical supply components.	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Identify electrical system components. 2. Identify current flow path in an electrical circuit.	*Benchmarks* 1. Identify and label components in a four-component electrical circuit. 2. Identify current flow path within the circuit with 100 percent accuracy.
What should students be able to do? At what level?	*Skills* Solve problems involving Ohm's law.	*Benchmarks* Measure and compute electrical, resistance, current, and voltage values in a circuit with 90 percent accuracy.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–2 2. Mathematical concepts related to Ohm's law 3. Measuring values in a circuit	

Sample Performance Task

Standards: This sample performance task targets the following Energy and Utilities industry sector foundation and Electromechanical Installation and Maintenance pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Algebra II (grades eight through twelve) 6.0	Students add, subtract, multiply, and divide complex numbers.
Foundation: Academics 1.2 Physics (grades nine through twelve) 5.a	Students know how to predict the voltage or current in simple direct current (DC) electrical circuits constructed from batteries, wires, resistors, and capacitors.
Foundation: Communications 2.1 Reading Comprehension (grades nine and ten) 2.1	Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purpose.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: EU A2.5	Know the fundamentals of basic electrical supply components.

Assignment: Working in a group, you will use the schematics and materials provided to:

1. Review the schematics, ten per group (Communications 2.1 Reading Comprehension [grades nine and ten] 2.1).
2. Determine which electrical supplies will be needed (EU A2.5) to:
   a. Assemble the circuit correctly according to the schematics specifications.
   b. Identify whether it is an AC or DC circuit.
3. Identify mathematically the resistance, voltage, current, and power of the circuit (Academics 1.1 Algebra II [grades eight through twelve] 6.0; Academics 1.2 Physics [grades nine through twelve] 5.a).
4. Test the circuit, using the electrical meters provided.

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
EU A2.5: Know the fundamentals of basic electrical supply components. (75 points)	Student correctly identifies the supplies necessary to complete the assignment. Student successfully uses the electrical components and schematic to construct functional AC and DC circuits on the first try. (75 points)	Student correctly identifies the supplies necessary to complete the assignment. Student successfully uses the electrical components and schematic to construct a functional AC or DC circuit on the first try. (70 points)	Student correctly identifies the supplies necessary to complete the assignment. Student uses the electrical components and schematic to construct a functional AC or DC circuit with assistance. (55 points)	Student cannot identify the supplies necessary to complete the assignment. Student cannot use the electrical components and schematic to construct a functional circuit. (40 points)
Academics 1.1 Algebra II (grades eight through twelve) 6.0: Students add, subtract, multiply, and divide complex numbers. (5 points)	Student, using a schematic, can mathematically solve for resistance, voltage, current, and power five out of five times. (5 points)	Student, using a schematic, can mathematically solve for resistance, voltage, current, and power three out of five times. (4 points)	Student, using a schematic, can mathematically solve for resistance, voltage, current, and power two out of five times. (2 points)	Student, using a schematic, is unable mathematically to solve for resistance, voltage, current, and power. (0 points)
Academics 1.2 Physics (grades nine through twelve) 5.a: Students know how to predict the voltage or current in simple direct current (DC) electrical circuits constructed from batteries, wires, resistors, and capacitors. (15 points)	Student solves ten electronic circuit problems without any errors. (15 points)	Student solves eight electronic circuit problems. (10 points)	Student solves six electronic circuit problems. (5 points)	Student is unable to solve more than five electronic circuit problems. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Communications 2.1 Reading Comprehension (grades nine and ten) 2.1: Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purpose. (5 points)	Student can read schematics and predict outcomes based upon values of components and circuitry. (5 points)	Student can predict outcomes of a schematic, given nominal values. (4 points)	Student is able to read and identify components within a schematic. (2 points)	Student is unable to identify or predict outcomes of a schematic. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Electromechanical Installation and Maintenance Pathway Occupations	
High school (diploma)	• Power Meter Reader • Electronic Utility Worker • Appliance Worker • Electronic Equipment Worker • Electrical Worker
Postsecondary training (certification and/or AA degree)	• Meter Installers/Repairers • Utility Technicians • Appliance Repair Technicians • Instrument Calibration Repairers • Electrical Technician
College or university (bachelor's degree or higher)	• Meter Service Engineers* • Utility Managers • Major Appliance Design Engineer* • Instrument Design Engineers* • Electrical Engineer*

Energy and Environmental Technology

Sample sequence of courses in the Energy and Environmental Technology pathway:

CTE courses	Related courses
Introductory • Exploring Technology • Technology Core	• Algebra • Geometry • Physical Science • English • Orientation to Apprenticeship
Concentration • Consumer Electronics • Machining • Engine Repair and Maintenance	
Capstone • Electronics • Metal Manufacturing • Electronic Repair and Maintenance	

Sample of appropriate foundation and pathway standards for the Consumer Electronics course in the Energy and Environmental Technology pathway:

Foundation standards

Academics 1.1 Number Sense (grade seven) 1.6: Calculate the percentage of increases and decreases of a quantity.

Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.

Communications 2.1 Reading Comprehension (grades nine and ten) 2.6: Demonstrate use of sophisticated learning tools by following technical directions (e.g., those found with graphic calculators and specialized software programs and in access guides to World Wide Web sites on the Internet).

Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 2.6: Deliver multimedia presentations:

a. Combine text, images, and sound and draw information from many sources (e.g., television broadcasts, videos, films, newspapers, magazines, CD-ROMs, the Internet, electronic media-generated images).
b. Select an appropriate medium for each element of the presentation.
c. Use the selected media skillfully, editing appropriately and monitoring for quality.
d. Test the audience's response and revise the presentation accordingly.

Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards

EU B1.0: Students understand energy resources and the effects of these resources and systems on the environment.

EU B1.1: Know how to classify various conventional energy resources by type: depletable, nondepletable, renewable, and nonrenewable.

Sample analysis ("unpacking") of a standard for the Consumer Electronics course in the Energy and Environmental Technology pathway:

Standard	**Energy and Utilities B1.0:** Students understand energy resources and the effects of these resources and systems on the environment.	
Standard subcomponent	**Energy and Utilities B1.1:** Know how to classify various conventional energy resources by type: depletable, nondepletable, renewable, and nonrenewable.	
Course level	❑ Introductory ☒ Concentration ❑ Capstone	
What do students need to know? At what level?	*Concepts* 1. Energy resources in the four categories 2. Existing sources of energy types within California 3. How energy is stored 4. How energy is conducted 5. How energy is procured	*Benchmarks* 1. Identify 100 percent accurately those that are depletable, nondepletable, renewable, nonrenewable. 2. Name one example of each the following: local power companies, state power companies, out-of-state energy providers. 3. Cite four examples of how energy is stored. 4. Cite one example for each energy category. 5. Describe local and statewide energy procurement procedures.
What should students be able to do? At what level?	*Skills* 1. Analyze energy efficiency. 2. Demonstrate understanding of energy conservation techniques.	*Benchmarks* 1. Determine which type of energy is most efficient for a given situation with 80 percent accuracy. 2. Demonstrate conservation techniques used at home, at school, and in at least one type of business.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–5 2. Procedure to determine level of energy efficiency 3. Conservation techniques 4. Computer graphics and presentation methods	

Sample Performance Task

Standards: This sample performance task targets the following Energy and Utilities industry sector foundation and Energy and Environmental Technology pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Number Sense (grade seven) 1.6	Calculate the percentage of increases and decreases of a quantity.
Foundation: Communications 2.1 Reading Comprehension (grades nine and ten) 2.6	Demonstrate use of sophisticated learning tools by following technical directions (e.g., those found with graphic calculators and specialized software programs and in access guides to World Wide Web sites on the Internet).

Standard number	Standards
Foundation: Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 2.6	Deliver multimedia presentations: a. Combine text, images, and sound and draw information from many sources (e.g., television broadcasts, videos, films, newspapers, magazines, CD-ROMs, the Internet, electronic media-generated images). b. Select an appropriate medium for each element of the presentation. c. Use the selected media skillfully, editing appropriately and monitoring for quality. d. Test the audience's response and revise the presentation accordingly.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: EU B1.1	Know how to classify various conventional energy resources by type: depletable, nondepletable, renewable, and nonrenewable.

Assignment: Working in cooperative learning groups of three to five students, you will complete the following task:

1. Complete a search on the Web (Communications 2.1 Reading Comprehension [grades nine and ten] 2.6) to:
   a. Identify the energy resources used by your local community.
   b. Determine the percentage of energy resources used by your local community from the following categories: depletable, nondepletable, renewable, nonrenewable (EU B1.1).
   c. Identify the projected use of energy resources for your local community during the coming year (Academics 1.1 Number Sense [grade seven] 1.6).
   d. Identify the usage of energy resources for your local community during the past year in each of the four energy categories.
2. Prepare a written report, including bar graphs, to describe your findings (Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 2.6).
3. Give a five- to ten-minute oral presentation, using visual displays (e.g., PowerPoint, printed graphs and charts) (Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 2.6).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
EU B1.1: Know how to classify various conventional energy resources by type: depletable, nondepletable, renewable, and nonrenewable. (65 points)	Students are able to classify various conventional energy resources types, giving six examples of each type used in global energy markets. (65 points)	Students are able to classify various conventional energy resources types, giving four examples of each type used in the United States. (60 points)	Students are able to classify various conventional energy resources types, giving two examples of each type used in the United States. (40 points)	Students are able to name the four conventional energy resource types but classify them incorrectly. (20 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Academics 1.1 Number Sense (grade seven) 1.6: Calculate the percentage of increases and decreases of a quantity. (10 points)	Students calculate the percentage of increase and decrease of energy resources for the four types of conventional energy resources, giving five examples for each. (10 points)	Students calculate the percentage of increase and decrease of energy resources for the four types of conventional energy resources, giving three examples for each. (5 points)	Students calculate the percentage of increase and decrease of energy resources for the four types of conventional energy resources, giving one example for each. (3 points)	Students calculate the percentage of increase and decrease of energy resources for up to three types of conventional energy resources. (1 point)
Communications 2.1 Reading Comprehension (grades nine and ten) 2.6: Demonstrate use of sophisticated learning tools by following technical directions (e.g., those found with graphic calculators and specialized software programs and in access guides to World Wide Web sites on the Internet). (10 points)	Students complete research on the Web to identify use of current energy resources in their state, as well as in at least two other states, in the depletable, nondepletable, renewable, and nonrenewable energy resource categories. (10 points)	Students complete research on the Web to identify use of current energy resources in their state, as well as in at least one other state, in the depletable, nondepletable, renewable, and nonrenewable energy resource categories. (5 points)	Students complete research on the Web to identify use of current energy resources in their state in the depletable, nondepletable, renewable, and nonrenewable energy resource categories. (2 points)	Students complete research on the Web to identify use of current energy resources in their state from two or fewer of the following energy resource categories: depletable, nondepletable, renewable, and nonrenewable. (1 point)
Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 2.6: Deliver multimedia presentations. (15 points)	Students develop and deliver multimedia classroom presentation on research project outlining energy resources in the local community as well as in the state. Presentation includes research information from at least three sources, done in PowerPoint format. (15 points)	Students develop and deliver multimedia classroom presentation on research project outlining energy resources in the local community as well as in the state. Presentation includes research information from at least two sources, done in PowerPoint format. (10 points)	Students develop and deliver multimedia classroom presentation on research project outlining energy resources in the local community as well as in the state. Presentation includes research information from at least one source, done in PowerPoint or overhead slide format. (3 points)	Students develop and deliver multimedia classroom presentation on research project outlining energy resources in the local community. Presentation includes information and is presented in overhead slide format. (1 point)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Energy and Environmental Technology Pathway Occupations	
High school (diploma)	• Energy Management Worker • Environmental Pollution Worker • Utilities Worker • Waste Management Worker • Industrial Facilities Worker
Postsecondary training (certification and/or AA degree)	• Energy Management Technician • Environmental Pollution Technician • Utilities Technician • Waste Management Technician • Industrial Facilities Technician
College or university (bachelor's degree or higher)	• Energy Management Engineer* • Environmental Engineer* • Utilities Engineer* • Waste Management Engineer* • Industrial Facilities Engineer*

Public Utilities

Sample sequence of courses in the Public Utilities pathway:

CTE courses	Related courses
Introductory • Exploring Technology • Technology Core	• Algebra • Geometry • English Composition/Writing • Chemistry • Orientation to Apprenticeship
Concentration • Consumer Electronics • Machining • Environmental Science	
Capstone • Electronic Repair and Maintenance • Metal Manufacturing • Hazardous Materials Management	

Sample of appropriate foundation and pathway standards for the Consumer Electronics course in the Public Utilities pathway:

Foundation standards	**Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a:** Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphic calculators) to perform tests, collect data, analyze relationships, and display data.

Foundation standards	**Communications 2.2 Writing Strategies and Applications (grades nine and ten) 1.3:** Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources.
	Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 2.6: Deliver multimedia presentations: a. Combine text, images, and sound and draw information from many sources (e.g. television broadcasts, videos, films, newspapers, magazines, CD-ROMs, the Internet, electronic media-generated images). b. Select an appropriate medium for each element of the presentation. c. Use the selected media skillfully, editing appropriately and monitoring for quality. d. Test the audience's response and revise the presentation accordingly.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway standards	**EU C1.0:** Students understand the advantages and disadvantages of energy resources in use or under research that influence or will influence the public utilities industry.
	EU C1.1: Know the new and emerging energy resources used in the public utilities industry.

Sample analysis ("unpacking") of a standard for the Consumer Electronics course in the Public Utilities pathway:

Standard	**Energy and Utilities C1.0:** Students understand the advantages and disadvantages of energy resources in use or under research that influence or will influence the public utilities industry.	
Standard subcomponent	**Energy and Utilities C1.1:** Know the new and emerging energy resources used in the public utilities industry.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. How energy resources are identified 2. Public utilities structure 3. Environmental impact of developing energy resources 4. Cost-effectiveness of energy resources	*Benchmarks* 1. Explain the rationale for geographical and geological surveys. 2. Explain and provide a basic diagram of existing and planned state and local public utilities infrastructure. 3. Cite two examples of environmental impact for developing and expanding each of four kinds of energy resources. 4. Explain basic issues in determining cost-effectiveness.
What should students be able to do? At what level?	*Skills* Determine kinds of energy resources currently and potentially in use by the public utilities industry.	*Benchmarks* List, identify, and describe major types and approximate percentages of energy resources in current use. Identify the top five potential types.

Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–4 2. Types of energy resources 3. Environmental impact information 4. Local and state governmental sources of information 5. Local and state governmental structures affecting public utilities

Sample Performance Task

Standards: This sample performance task targets the following Energy and Utilities industry sector foundation and Public Utilities pathway standards:

Standard number	Standards
Foundation: Communications 2.2 Writing Strategies and Applications (grades nine and ten) 1.3	Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources.
Foundation: Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 2.6	Deliver multimedia presentations: a. Combine text, images, and sound and draw information from many sources (e.g., television broadcasts, videos, films, newspapers, magazines, CD-ROMs, the Internet, electronic media-generated images). b. Select an appropriate medium for each element of the presentation. c. Use the selected media skillfully, editing appropriately and monitoring for quality. d. Test the audience's response and revise the presentation accordingly.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: EU C1.1	Know the new and emerging energy resources used in the public utilities industry.

Assignment: Working in cooperative learning groups of three to five students, you will complete the following task:

1. Complete a search on the Web (Communications 2.2 Writing Strategies and Applications [grades nine and ten] 1.3) to:
   a. Identify the energy resources used by your local community (EU C1.1).
   b. Determine the percentage of energy resources used by your local community from the following categories: depletable, nondepletable, renewable, nonrenewable.
   c. Identify the projected use of energy resources for your local community for the coming year.
   d. Identify the usage of energy resources for your local community during the past year in each of the four energy categories (EU C1.1).
2. Prepare a written report of three to five pages, including bar graphs, to describe your findings (Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 2.6).
3. Give a five- to ten-minute oral presentation, using visual displays (e.g., Powerpoint, printed graphs and charts) (Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 2.6).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
EU C1.1: Know the new and emerging energy resources used in the public utilities industry. (75 points)	Students demonstrate a clear understanding of new and emerging energy resources currently in use as well as those being developed for use in the next five years in their local community and throughout the state. (75 points)	Students demonstrate a clear understanding of new and emerging energy resources currently in use as well as those being developed for use in the next five years in their local community. 70 points)	Students demonstrate a clear understanding of new and emerging energy resources currently in use in their local community. (50 points)	Students demonstrate a limited understanding of energy resources currently in use in their local community. (30 points)
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 1.3: Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources. (18 points)	Students prepare multimedia classroom presentation and written report based on research (including Web search), periodical reviews, local and state public utility staff interviews. Report is accurate as validated by local business representatives. (18 points)	Students prepare multimedia classroom presentation and written report based on research (including Web search), periodical reviews, and local public utility staff interviews. Report is accurate as validated by local business representatives. (15 points)	Students prepare a written report based on research (including Web search), periodical reviews, and local public utility staff interviews. Report is accurate as validated by local business representatives. (10 points)	Students prepare a written report based on up to two of the following research elements: Web search, periodical reviews, and local public utility staff interviews. (3 points)
Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 2.6: Deliver multimedia presentations. (10 points)	Students develop and present multimedia classroom presentation on research project outlining energy resources in local community as well as in the state. Presentation includes research information from at least three sources, done in PowerPoint format. (10 points)	Students develop and present multimedia classroom presentation on research project outlining energy resources in local community. Presentation includes research information from at least three sources, done in PowerPoint format. (8 points)	Students develop a classroom presentation on research project outlining energy resources in local community. Presentation includes research information from at least three sources, done in PowerPoint format. (5 points)	Students submit a written report on research project outlining energy resources in local community. (2 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Public Utilities Pathway Occupations	
High school (diploma)	• Meter Reader • Power Line Worker • Facility Worker • Waste Management Worker
Postsecondary training (certification and/or AA degree)	• Meter Installer • Power Line Technician • Facility Technician • Waste/Sewer Technician
College or university (bachelor's degree or higher)	• Meter Design Engineer* • Power Grid Engineer* • Facilities Design Engineer* • Sanitation Engineer*

Residential and Commercial Energy and Utilities

Sample sequence of courses in the Residential and Commercial Energy and Utilities pathway:

CTE courses	Related courses
Introductory • Exploring Technology • Technology Core	• Physical Science • Algebra • Geometry • English • Orientation to Apprenticeship
Concentration • Machining Facility • Woods • Drafting	
Capstone • HVAC Technician • Construction • CAD/CAM	

Sample of appropriate foundation and pathway standards for the Technology Core course in the Residential and Commercial Energy and Utilities pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.1:** Read, write, and compare rational numbers in scientific notation (positive and negative powers of ten) with approximate numbers using scientific notation.
	Academics 1.1 Algebra II (grades nine through twelve) 6.0: Students add, subtract, multiply, and divide complex numbers.
	Academics 1.2 Physics (grades nine through twelve) 3.a: Students know heat flow and work are two forms of energy transfer between systems.

Foundation standards	**Academics 1.2 Physics (grades nine through twelve) 5.a:** Students know how to predict the voltage or current in simple direct current (DC) electrical circuits constructed from batteries, wires, resistors, and capacitors.
	Communications 2.1 Reading Comprehension (grades nine and ten) 2.1: Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purpose.
	Communications 2.1 Reading Comprehension (grades nine and ten) 2.6: Demonstrate use of sophisticated learning tools by following technical directions (e.g., those found with graphic calculators and specialized software programs and in access guides to World Wide Web sites on the Internet).
Pathway standards	**EU D3.0:** Students understand the role and function of tools and machines in the residential and commercial energy and utilities industry.
	EU D3.1: Know how to select and safely use hand and power tools, equipment, and machines common to residential and commercial energy and utilities systems.

Sample analysis ("unpacking") of a standard for the Technology Core course in the Residential and Commercial Energy and Utilities pathway:

Standard	**Energy and Utilities D3.0:** Students understand the role and function of tools and machines in the residential and commercial energy and utilities industry.	
Standard subcomponent	**Energy and Utilities D3.1:** Know how to select and safely use hand and power tools, equipment, and machines common to residential and commercial energy and utilities systems.	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Identification of hand and power tools, equipment, and machines 2. Safety procedures and systems 3. Use of tools and machines	*Benchmarks* 1. Describe residential and commercial applications of basic hand and power tools, equipment, and machines. 2. Use tools and equipment in a safe and proper manner. 3. Select appropriate basic tools and machines for given tasks.
What should students be able to do? At what level?	*Skills* 1. Demonstrate the ability to use tools and machines. 2. Identify proper tools and machines used in the industry.	*Benchmarks* 1. Pass safety tests associated with tools and machines. 2. Select proper tools for five classroom tasks as assigned.
Topics and contexts **What must be taught?**	1. Tool and machine identification 2. Safety information 3. Tool and machine use	

Sample Performance Task

Standards: This sample performance task targets the following Energy and Utilities industry sector foundation and Residential and Commercial Energy and Utilities pathway standards:

Standard number	Standards
Foundation: Academics 1.2 Physics (grades nine through twelve) 5.a	Students know how to predict the voltage or current in simple direct current (DC) electric circuits constructed from batteries, wires, resistors and capacitors.
Foundation: Communications 2.1 Reading Comprehension (grades nine and ten) 2.6	Demonstrate use of sophisticated learning tools by following technical directions (e.g., those found with graphic calculators and specialized software programs and in access guides to World Wide Web sites on the Internet).
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: EU D3.1	Know how to select and safely use hand and power tools, equipment, and machines common to residential and commercial energy and utilities systems.

Assignment: In this assignment you will:

1. Select the proper tools and equipment to measure, record, and evaluate components safely in the residential and commercial utilities involved with the following:
   a. Electricity (include voltage measurements) (Academics 1.2 Physics [grades nine through twelve] 5.a)
   b. Pressure
   c. Vacuum systems
2. Explain, for each tool identified, at least two personal and two functional safety rules (EU D3.1).
3. Demonstrate the operational use of at least two tools or pieces of equipment on a classroom model for each function: electrical, pressure, and vacuum (EU D3.1).
4. Show on the blueprint/schematic/wiring diagram where the major components are located for electrical, HVAC, and pressure systems (Communications 2.1 Reading Comprehension [grades nine and ten] 2.6).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
EU D3.1: Know how to select and safely use hand and power tools, equipment, and machines common to residential and commercial energy and utilities systems. (70 points)	Students demonstrate a clear knowledge of electrical measurement tools, vacuum measurement tools, and pressure tools by identifying the tools and their use with a 95 percent success rate. (70 points)	Students demonstrate knowledge of electrical measurement tools, vacuum measurement tools and pressure tools by identifying the tools and their use with a 75 percent success rate. (60 points)	Students demonstrate some knowledge of electrical measurement tools, vacuum measurement tools and pressure tools by identifying the tools and their use with a 70 percent success rate. (50 points)	Students demonstrate insufficient knowledge of electrical measurement tools, vacuum measurement tools, and pressure tools by identifying the tools and their use with less than a 70 percent success rate. (40 points)
Academics 1.2 Physics (grades nine through twelve) 5.a: Students know how to predict the voltage or current in simple direct current (DC) electric circuits constructed from batteries, wires, resistors and capacitors. (15 points)	Students use electrical measurement tools, vacuum measurement tools, and pressure tools to construct and predict the voltage or current in four simple direct current (DC) electric circuits. (15 points)	Students use electrical measurement tools, vacuum measurement tools, and pressure tools to construct and predict the voltage or current in three simple direct current (DC) electric circuits. (10 points)	Students use electrical measurement tools, vacuum measurement tools, and pressure tools to construct and predict the voltage or current in two simple direct current (DC) electric circuits. (5 points)	Students demonstrate a limited use of electrical measurement tools, vacuum measurement tools, and pressure tools to construct and predict the voltage or current in one or fewer simple direct current (DC) electric circuits. (0 points)
Communications 2.1 Reading Comprehension (grades nine and ten) 2.6: Demonstrate use of sophisticated learning tools by following technical directions (e.g., those found with graphic calculators and specialized software programs and in access guides to World Wide Web sites on the Internet). (15 points)	Students review and accurately identify the potential differences between electrical, pressure, and vacuum components as related to four blueprint/wiring diagrams or schematics. (15 points)	Students review and accurately identify the potential differences between electrical, pressure, and vacuum components as related to three blueprint/wiring diagrams or schematics. (10 points)	Students review and accurately identify the potential differences between electrical, pressure, and vacuum components as related to two blueprint/wiring diagrams or schematics. (5 points)	Students review and accurately identify the potential differences between electrical, pressure, and vacuum components as related to one or fewer blueprint/wiring diagrams or schematics. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Residential and Commercial Energy Utilities Pathway Occupations	
High school (diploma)	• Electrical Helper • Solar Helper • HVAC Worker • Entertainment System Helper • Industrial Maintenance Worker
Postsecondary training (certification and/or AA degree)	• Electrician/Technician • Solar Technician* • Facilities Technician • Entertainment System Technician/Installer • Industrial Maintenance Technician/Worker
College or university (bachelor's degree or higher)	• Electrical Engineer* • Solar Engineer* • Facilities/Maintenance Engineer* • Entertainment System Engineer* • Industrial Maintenance Engineer*

Note

1. Bureau of Labor Statistics, *Career Guide: Utilities.* Washington, D.C.: U.S. Department of Labor, 2005. http://www.bls.gov/oco/cg/cgs018.htm

Engineering and Design Industry Sector

The Engineering and Design industry sector provides a strong foundation in engineering and design for students in California. The students are engaged in an instructional program that integrates academic and technical preparation and focuses on career awareness, career exploration, and career preparation in five pathways. To prepare students for the vast scope of job opportunities in this field, middle schools, high schools, regional occupational centers and programs, apprenticeship programs, community colleges, and four-year colleges and universities provide education and training in engineering-related occupations. The demand for engineers in a variety of specializations throughout the state and the nation will remain high.[1]

The five pathways in this sector emphasize real-world, occupationally relevant experiences of significant scope and depth. To prepare students for continued training, advanced educational opportunities, and direct entry to a career, the engineering and design programs offer the following components: classroom, laboratory, and hands-on contextual learning; project- and work-based instruction; internships, community classroom, and cooperative career technical education; work experience education; and leadership and interpersonal skills development.

Engineering and Design Industry Sector Pathways:

- Architectural and Structural Engineering
- Computer Hardware, Electrical, and Networking Engineering
- Engineering Design
- Engineering Technology
- Environmental and Natural Science Engineering

Architectural and Structural Engineering

Sample sequence of courses in the Architectural and Structural Engineering pathway:

CTE courses	Related courses
Introductory • Introduction to Design Drafting • Introduction to CAD • Principles of Engineering • Technology Core	• English Composition/Writing • Physics/Applied Physics • Geology • Chemistry • Algebra • Geometry • Trigonometry • Orientation to Apprenticeship
Concentration • Architectural Design • Design Drafting • Technical Drafting • Mechanical Drawing • Engineering Technology	
Capstone • Advanced Architectural Design • Computer-aided Design (CAD/CAM) • Engineering Design	

Sample of appropriate foundation and pathway standards for the Architectural Design course in the Architectural and Structural Engineering pathway:

Foundation standards	**Academics 1.1 Geometry (grades eight through twelve) 15.0:** Students use the Pythagorean theorem to determine distance and find missing lengths of sides of right triangles.
	Communications 2.3 Written and Oral English Language Conventions (grades eleven and twelve) 1.2: Produce legible work that shows accurate spelling and correct punctuation and capitalization.
	Career Planning and Management 3.3: Develop a career plan that is designed to reflect career interests, pathways, and postsecondary options.
	Technology 4.1: Understand past, present, and future technological advances as they relate to a chosen pathway.
	Problem Solving and Critical Thinking 5.1: Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**ED A3.0:** Students understand the relationship between architecture and the external environment.
	ED A4.0: Students understand the mechanics and properties of structural materials.
	ED A7.0: Students understand how to systematically complete an architectural project.

Sample analysis ("unpacking") of a standard for the Architectural Design course in the Architectural and Structural Engineering pathway:

Standard	**Engineering and Design A3.0:** Students understand the relationship between architecture and the external environment.	
Standard subcomponent	**Engineering and Design A3.4:** Develop a complete set of architectural plans and drawings.	
Course level	❑ Introductory ☒ Concentration ❑ Capstone	
What do students need to know? At what level?	*Concepts* 1. Basic drafting concepts 2. Drawing layout 3. Drawings to include in a set of plans 4. Architectural standards 5. Styles of architecture	*Benchmarks* 1. Define and explain *proportion* and *scale.* 2. Lay out all appropriate information in an organized manner. 3. List the types of drawings to be included in set of plans. 4. Cite and explain basic standards in building codes. 5. Describe at least six styles of architecture common in the U.S. and their distinguishing characteristics.
What should students be able to do? At what level?	*Skills* 1. How to develop and lay out drawings 2. How to measure accurately 3. How to complete design project that conforms to local building codes	*Benchmarks* 1. Lay out drawings correctly. 2. Use scales to measure with 100 percent accuracy. 3. Complete a set of plans that conforms to all local building codes.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–5 2. Local building codes 3. Accurate measurement and layout techniques	

Sample Performance Task

Standards: This sample performance task targets the following Engineering and Design industry sector foundation and Architectural and Structural Engineering pathway standards:

Standard number	Standards
Foundation: Communications 2.3 Written and Oral English Language Conventions (grades eleven and twelve) 1.2	Produce legible work that shows accurate spelling and correct punctuation and capitalization.
Foundation: Problem Solving and Critical Thinking 5.1	Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: ED A3.4	Develop a complete set of architectural plans and drawings.

Assignment: Choose your favorite style of architecture and develop a full set of plans and drawings for a 4,000-square-foot multilevel custom home. The architectural style you choose will help determine the location of your lot somewhere in the continental United States. The plans should include a plot plan (may be fictitious but drawn in proper format), complete floor plans for each level, and all four elevations. Include any additional drawings necessary to have your plans approved. Create sketches to determine the proper layout and number of drawing sheets necessary (ED A3.4).

Draw and letter all title blocks in architectural format. Please note that you will be graded on neatness as well as accuracy (Communications 2.3 Written and Oral English Language Conventions [grades eleven and twelve] 1.2). You will receive additional points for creativity (Problem Solving and Critical Thinking 5.1). Produce a set of clean, smudge-free drawings, making sure that all information is clearly stated and your line work is well defined, with proper line weights and type. Use your text as a reference to make sure you have accurate information regarding architectural standards (ED A3.4).

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ED A3.4: Develop a complete set of architectural plans and drawings.	The set of architectural plans and drawings is clean, complete, and executed to a professional standard. Plans are innovative and use unique elements that work well with the architectural style.	The set of architectural plans is clean and complete. Plans are competently executed, with some creative touches.	The set of architectural plans is complete. Some errors exist, and the work may not be smudge-free.	The set of architectural plans is incomplete and may contain errors and smudges.
Communications 2.3 Written and Oral English Language Conventions (grades eleven and twelve) 1.2: Produce legible work that shows accurate spelling and correct punctuation and capitalization.	All work is comprehensible and legible, with accurate spelling and correct punctuation and capitalization. Organization and presentation of work are flawless.	All work is comprehensible and legible, with accurate spelling and correct punctuation and capitalization.	Work is legible but contains some errors in spelling, punctuation, or capitalization. Work shows less than a desirable level of effort.	Work contains many errors and omissions and shows little or no effort.

Standards	Advanced	Proficient	Basic	Unacceptable
Problem Solving and Critical Thinking 5.1: Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.	Using logic and critical thinking skills, students produce a very accurate set of drawings. Scale and proportion are replicated accurately through analysis and observation. Creative solutions are used in an exceptional manner.	Using logic and critical thinking skills, students produce an accurate set of drawings. Scale and proportion are replicated satisfactorily through analysis and observation. Creative solutions are used in an average manner.	Using logic and critical thinking skills, students produce a set of drawings. Scale and proportion are replicated, with some deficiencies, through analysis and observation. Creative solutions are not used effectively.	Using minimal logic and critical thinking skills, students produce a set of drawings. Scale and proportion are not replicated well. Creative solutions are not used.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of Pathway Occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Architectural and Structural Engineering Pathway Occupations	
High school (diploma)	• Junior Drafter • CAD Technician • Construction Apprentice • Engineering Aide • Drafting Apprentice
Postsecondary training (certification and/or AA degree)	• Drafter/Designer • Plan Checker • Engineering Technician • Surveyor • Estimator
College or university (bachelor's degree or higher)	• Architect* • Industrial Designer* • Civil Engineer* • Structural Engineer* • Instructor*

Computer Hardware, Electrical, and Networking Engineering

Sample sequence of courses in the Computer Hardware, Electrical, and Networking Engineering pathway:

CTE courses	Related courses
Introductory • Technical Core • Electricity/Electronics • Computer Fundamentals • Exploring Technology	• Physics • English Composition • Algebra • Geometry • Trigonometry • Orientation to Apprenticeship
Concentration • Computer Systems Design/Maintenance • Electrical Codes and Systems • Computer and Communications Networking	
Capstone • Essentials of Information Technology (A+) • Electrical/Electronic Technology • Computer Networking and Administration	

Sample of appropriate foundation and pathway standards for the Computer Systems Design/Maintenance course in the Computer Hardware, Electrical, and Networking Engineering pathway:

Foundation standards

Academics 1.1 Geometry (grades eight through twelve) 15.0: Students use the Pythagorean theorem to determine distance and find missing lengths of sides of right triangles.

Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6: Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).

Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 1.7: Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.

Career Planning and Management 3.3: Develop a career plan that is designed to reflect career interests, pathways, and postsecondary options.

Technology 4.1: Understand past, present, and future technological advances as they relate to a chosen pathway.

Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.

Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards	**ED B3.0:** Students know the fundamentals of the theory, measurement, control, and applications of electrical energy, including alternating and direct currents.
	ED B4.0: Students understand computer systems and solve computer-related problems from an engineering perspective.
	ED B5.0: Students understand the design process and how to solve analysis and design problems.

Sample analysis ("unpacking") of a standard for the Computer Systems Design/Maintenance course in the Computer Hardware, Electrical, and Networking Engineering pathway:

Standard	**Engineering and Design B5.0:** Students understand the design process and how to solve analysis and design problems.	
Standard subcomponent	**Engineering and Design B5.6:** Build a prototype from plans and test it.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. The appearance of components 2. Plans and diagrams	*Benchmarks* 1. Identify all device components. 2. Identify elements of plans and diagrams with 75 percent accuracy.
What should students be able to do? At what level?	*Skills* 1. How to place components as specified in plans or diagrams 2. How to assemble a prototype device or system 3. How to evaluate the performance of a prototype device or system	*Benchmarks* 1. Place components with 75 percent accuracy. 2. Perform all assembly steps without error or hesitation. 3. Test a prototype device or system and determine whether it meets design criteria.
Topics and contexts **What must be taught?**	1. Basic knowledge of system components, their symbols, and their characteristics 2. Basic knowledge of fabrication and assembly 3. Knowledge of testing devices or system functions	

Sample Performance Task

Standards: This sample performance task targets the following Engineering and Design industry sector foundation and Computer Hardware, Electrical, and Networking Engineering pathway standards:

Standard number	Standards
Foundation: Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 1.7	Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: ED B5.6	Build a prototype from plans and test it.

Assignment: You will be part of a four-member prototype development and assembly team brainstorming and developing a plan to assemble and evaluate an experimental electronic or computer-operated device, network, or system. Each of you will participate in identifying and correctly placing components. Your team will assess its progress to ensure that the plans are being followed or that modifications are made when necessary to produce a working product (ED B5.6).

Upon completion the device, network, or system will be tested according to preformulated performance standards to determine whether it functions as designed. Additionally, your team will make a presentation, including computer-generated graphics on at least 12 slides, to your classmates to demonstrate that the conditions of the assignment were met (2.4 Listening and Speaking Strategies and Applications [grades nine and ten] 1.7; Leadership and Teamwork 9.3).

The completed project and presentation will provide evidence that each team member will have the ability to (1) identify components; (2) fabricate assemblies or subassemblies; (3) analyze information; (4) find solutions to problems; and (5) evaluate the performance of a prototype and redesign, when necessary, on the basis of collected data (ED B5.6; Leadership and Teamwork 9.3).

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ED B5.0: Students understand the design process and how to solve analysis and design problems.	The item is fabricated in a manner that meets industry standards for quality. Collected and interpreted data verify that it works as designed.	The item is fabricated with only minor flaws when compared with industry standards. Project meets but does not exceed design criteria according to collected data.	Project has three or more minor flaws when compared with industry standards. Project fails to meet one or two design criteria according to collected data.	Project has one or more major flaws that preclude it from meeting industry standards. Data collection is incomplete. Project does not function as designed.
Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 1.7: Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.	The team produces and presents computer-rendered and visually projected slides. The presentation is clear and comprehensive and involves all team members.	The team produces and presents computer-rendered and visually projected slides. Each member participates in an oral report that explains the project.	The team produces and presents computer-rendered and visually projected slides of minimal quality. Only some members participate in an oral report that explains the project.	The team fails to produce and present visually projected slides. Only some members participate in an oral report that explains the project.
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.	The team is observed working cooperatively and effectively. All members participate and contribute. Effective use is made of the tools of TQM and QI. Project is completed before the deadline.	The team is observed working effectively. Most members participate and contribute. Effective use is made of the tools of TQM and QI. Project is completed no later than the deadline.	The team is observed working with a minimum of cooperation. Not all members participate and contribute. Minimal use is made of the tools of TQM and QI. Project is completed later than the deadline.	The team is observed not working cooperatively. Not all members participate and contribute. Ineffective or no use is made of the tools of TQM and QI. Project is completed late.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of Pathway Occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Computer Hardware, Electrical, and Networking Engineering Pathway Occupations	
High school (diploma)	• Electrician's Helper • Telecommunications/Security Equipment Installer • Computer Equipment Installer • Computer Repairer • Apprentice Electrician
Postsecondary training (certification and/or AA degree)	• Electrician* • Telecommunications Technician • Computer Networking Technician* • Computer Technician* • Journeyman Electrician
College or university (bachelor's degree or higher)	• Electrical Engineer* • Telecommunications Engineer • Computer Engineer • Network Administrator • Instructor*

Engineering Design

Sample sequences of courses in the Engineering Design pathway:

CTE courses	Related courses
Introductory • Introduction to Drafting • Introduction to CAD • Principles of Technology • Exploring Technology	• Physics • English Composition/Writing • Algebra • Geometry • Trigonometry • Calculus • Metal/Materials Analysis
Concentration • Design Drafting • Mechanical Drawing • Architectural Design • Engineering Technology	
Capstone • Computer-aided Design (CAD) • Advanced Architectural Design • Engineering Design • Electrical/Mechanical Technology	

Sample of appropriate foundation and pathway standards for the Engineering Design course in the Engineering Design pathway:

Foundation standards	**Academics 1.1 Geometry (grades eight through twelve) 15.0:** Students use the Pythagorean theorem to determine distance and find missing lengths of sides of right triangles.

Foundation standards	**Communications 2.3 Written and Oral English Language Conventions (grades eleven and twelve) 1.2:** Produce legible work that shows accurate spelling and correct punctuation and capitalization.
	Career Planning and Management 3.3: Develop a career plan that is designed to reflect career interests, pathways, and postsecondary options.
	Technology 4.1: Understand past, present, and future technological advances as they relate to a chosen pathway.
	Problem Solving and Critical Thinking 5.1: Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**ED C2.0:** Students understand the effective use of engineering design equipment.
	ED C4.0: Students use proper projection techniques to develop orthographic drawings.
	ED C10.0: Students understand the sketching process used in concept development.

Sample analysis ("unpacking") of a standard for the Engineering Design course in the Engineering Design pathway:

Standard	**Engineering and Design C4.0:** Students use proper projection techniques to develop orthographic drawings.	
Standard subcomponent	**Engineering and Design C4.2:** Understand the orthographic projection process for developing multiview drawings.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Drafting equipment 2. View layout 3. Orthographic projection 4. Multiview drawing	*Benchmarks* 1. Identify and explain use of all drafting equipment. 2. Describe multiview layouts. 3. Define and explain *orthographic projection.* 4. List steps used in orthographic projection to develop a multiview drawing.
What should students be able to do? At what level?	*Skills* 1. How to lay out drawing correctly 2. How to measure accurately 3. Sketching techniques 4. How to transfer information from one view to another in a multiview drawing	*Benchmarks* 1. Lay out drawing with 90 percent accuracy. 2. Use scales to measure with 100 percent accuracy. 3. Use at least three different sketching techniques. 4. Transfer information from one view to another in a multiview drawing with 90 percent accuracy.

Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–4 2. Basic knowledge of multiview layouts 3. Accurate measurement and layout techniques

Sample Performance Task

Standards: This sample performance task targets the following Engineering and Design industry sector foundation and Engineering Design pathway standards:

Standard number	Standards
Foundation: Communications 2.3 Written and Oral English Language Conventions (grades eleven and twelve) 1.2	Produce legible work that shows accurate spelling and correct punctuation and capitalization.
Foundation: Problem Solving and Critical Thinking 5.1	Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: ED C4.2	Understand the orthographic projection process for developing multiview drawings.

Assignment: Produce an orthographically projected multiview drawing, using a three-dimensional object as a model. Use a scale to measure the object so that you have accurate measurements to lay out your drawing properly. Produce a sketch that shows your measurement and layout before you start on the final drawing (ED C4.2; Problem Solving and Critical Thinking 5.1). Draw and letter the title block before you start laying out the actual drawing.

Note: You will be graded on neatness as well as accuracy (Communications 2.3 Written and Oral English Language Conventions [grades eleven and twelve] 1.2). Produce a clean, smudge-free drawing, making sure that your lines are well defined. Use proper line weights and line types. Use your text as a reference to make sure you are using the correct techniques (ED C4.200).

Performance task rubric*:* Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ED C4.2: Understand the orthographic projection process for developing multiview drawings.	A clean drawing is produced with three accurately placed views and all points projected in each view. All work is done to professional standards.	A clean drawing is produced with three accurately placed views and most points projected in each view. Work is done in an average manner.	A drawing is produced with three views and most points projected in each view. Some errors exist, and the work may not be smudge-free.	A drawing is produced with inconsistencies in the placement of views. Points are not projected accurately. Information is missing.

Standards	Advanced	Proficient	Basic	Unacceptable
Communications 2.3 Written and Oral English Language Conventions (grades eleven and twelve) 1.2: Produce legible work that shows accurate spelling and correct punctuation and capitalization.	Students produce legible work that shows accurate spelling and correct punctuation and capitalization. All work is done in a professional manner.	Students produce legible work that shows accurate spelling and correct punctuation and capitalization. All work is done in an average manner.	Students produce work that shows spelling, punctuation, and capitalization with some errors. Work shows less than a desirable level of effort.	Students produce work that shows spelling, punctuation, and capitalization with many errors and omissions. Work shows little or no effort.
Foundation: Problem Solving and Critical Thinking 5.1: Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.	Students use logic and critical thinking skills to produce a very accurate drawing from the model. Scale and proportion are replicated accurately through analysis and observation. Creative solutions are used in a professional manner.	Students use logic and critical thinking skills to produce an accurate drawing from the model. Scale and proportion are replicated satisfactorily, with one or two errors. Solutions are somewhat creative.	Students use logic and critical thinking skills to produce a drawing from the model. Scale and proportion are replicated, with more than two errors. Solutions show little thought.	Students do not produce a drawing from the model, or scale and proportion are not replicated well.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of Pathway Occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Engineering Design Pathway Occupations	
High school (diploma)	• Junior Drafter/Trainee • Construction Apprentice • Engineering Aide • CAD Technician • Design/Drafting Apprentice
Postsecondary training (certification and/or AA degree)	• Drafter/Designer • Engineering Technician • CAD/CAM Specialist • Journeyman Drafter
College or university (bachelor's degree or higher)	• Architect* • Industrial Designer* • Structural Engineer* • Civil Engineer* • Instructor*

Engineering Technology

Sample sequence of courses in the Engineering Technology pathway:

CTE courses	Related courses
Introductory • Technology Core • Introduction to Electricity/ Electronics • Metal Technology • Introduction to Computers • Introduction to Drafting/CADD • Exploring Technology • Introduction to Engineering Technology	• Physics • Chemistry • English Composition • Trigonometry • Orientation to Apprenticeship
Concentration • Electro-Mechanical Systems • Digital Logic Design • Mechatronics/Robotics	
Capstone • Telecommunications • Electrical/Electronic Technology • Industrial Engineering Technology	

Sample of appropriate foundation and pathway standards for the Introduction to Engineering Technology course in the Engineering Technology pathway:

Foundation standards	**Academics 1.1 Algebra I (grades eight through twelve) 5.0:** Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
	Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.
	Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6: Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).
	Career Planning and Management 3.3: Develop a career plan that is designed to reflect career interests, pathways, and postsecondary options.
	Technology 4.1: Understand past, present, and future technological advances as they relate to a chosen pathway.
	Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards	**ED D4.0:** Students understand how the principles of force, work, rate, power, energy, and resistance relate to mechanical, electrical, fluid, and thermal engineering systems.
	ED D5.0: Students understand the design process and how to solve analyze and design problems.
	ED D6.0: Students understand industrial engineering processes, including the use of tools and equipment, methods of measurement, and quality assurance.

Sample analysis ("unpacking") of a standard for the Introduction to Engineering Technology course in the Engineering Technology pathway:

Standard	**Engineering and Design D4.0:** Students understand how the principles of force, work, rate, power, energy, and resistance relate to mechanical, electrical, fluid, and thermal engineering systems.	
Standard subcomponent	**Engineering and Design D4.4:** Know how energy is transferred; know the effects of resistance in mechanical, electrical, fluid, and thermal systems.	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Mechanical energy transfer and resistance 2. Thermal energy transfer and resistance 3. Electrical energy transfer and resistance 4. Fluid energy transfer and resistance 5. Energy transfer and resistance in everyday life	*Benchmarks* 1. Explain and give three examples of mechanical energy transfer and resistance. 2. Explain and give three examples of thermal energy transfer and resistance. 3. Explain and give three examples of electrical energy transfer and resistance. 4. Explain and give three examples of fluid energy transfer and resistance. 5. Explain five ways in which energy transfer and resistance are utilized in machines and systems that affect our everyday lives.
What should students be able to do? At what level?	*Skills* 1. How to measure energy movement in the four energy systems 2. How to choose effective conductors and resistors for each energy system	*Benchmarks* 1. Use system-specific instrumentation to measure energy movement with at least 70 percent accuracy. 2. Determine efficiency of conductors and resistors for each energy system to at least 70 percent accuracy.
Topics and contexts **What must be taught?**	1. Physics of energy transfer for each of the energy systems 2. Measurement of energy movement 3. Choices of effective conductors and resistors	

Sample Performance Task

Standards: This sample performance task targets the following Engineering and Design industry sector foundation and Engineering Technology pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Algebra I (grades eight through twelve) 5.0	Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
Foundation: Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a	Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: ED 4.4	Know how energy is transferred; know the effects of resistance in mechanical, electrical, fluid, and thermal systems.

Assignment: This activity will help identify and measure the flow of energy for fluid systems. Work on a team consisting of three other students (ED D4.4; Leadership and Teamwork 9.3). The activities for each energy system are listed as follows. Be sure to keep clear, legible, and thorough laboratory notes for each activity, including all mathematical calculations (Academics 1.1 Algebra I [grades eight through twelve] 5.0; Academics 1.2 Investigation and Experimentation [grades nine through twelve] 1.a).

Using a small computer fan, a paper tube, and a turbine made from a fan blade and toy electric motor, your team will construct an apparatus that will cause a light-emitting diode connected across the motor to illuminate when air (a fluid) is pushed by the fan to spin the wind generator. This activity will demonstrate how energy can be transferred through the movement of a fluid (ED D4.4).

Your group will write a 500-word report describing the process for creating and testing the fluid energy demonstration project, your findings, and your assessment of the accuracy of those findings. Staple raw data from each of the preceding tasks to the back of your report (Academics 1.2 Investigation and Experimentation [grades nine through twelve] 1.a; Leadership and Teamwork 9.3).

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ED D4.4: Know how energy is transferred; know the effects of resistance in mechanical, electrical, fluid, and thermal systems.	All student observations are validated by correct interpretations of gathered data. Tests on energy transfer are completed with above 90 percent accuracy.	Most student observations are validated by correct interpretations of gathered data. Tests on energy transfer are completed with 80 percent accuracy.	Student observations and interpretations of gathered data are flawed. Tests on energy transfer are completed with 70 percent accuracy.	Student observations of gathered data are incomplete or incorrect. Tests on energy transfer are completed with below 70 percent accuracy.
Academics 1.1 Algebra I (grades eight through twelve) 5.0: Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.	All calculations in determining the transfer of energy are correct. Students derive and make correct use of formulae in every instance.	Most calculations in determining the transfer of energy are correct. Students derive and make correct use of formulae.	Some calculations for determining the transfer of energy have errors. Students have some errors in the use of formulae.	Many calculations in determining the transfer of energy have errors. Students have numerous errors in the use of formulae.
Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.	Report accurately and thoroughly describes the process used and makes good use of recorded laboratory data to explain findings. Report provides in-depth assessment of the accuracy of the findings and extrapolates possible conclusions. Raw findings are included.	Report accurately describes the process used and makes good use of recorded laboratory data to explain findings. Report provides basic assessment of the accuracy of the findings. Raw findings are included.	Report describes the process used and makes some use of recorded laboratory data to explain findings. Report fails to assess accuracy of the findings or includes other omissions. Raw findings are included.	Report is incomplete, or raw findings are not included.

Standards	Advanced	Proficient	Basic	Unacceptable
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.	The team is observed working cooperatively and effectively. All members participate and contribute. Effective use is made of the tools of TQM and QI. Project is completed before the deadline.	The team is observed working effectively. Most members participate and contribute. Effective use is made of the tools of TQM and QI. Project is completed no later than the deadline.	The team is observed working with a minimum of cooperation. Not all members participate and contribute. Minimal use is made of the tools of TQM and QI. Project is completed later than the deadline.	The team is observed not working cooperatively. Not all members participate and contribute. Ineffective or no use is made of the tools of TQM and QI. Project is completed late.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of Pathway Occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Engineering Technology Pathway Occupations	
High school (diploma)	• Electronic Mechanic Helper • Telecommunications/Security Equipment Installer • Apprentice Technician • HVAC Installer
Postsecondary training (certification and/or AA degree)	• Electronic Mechanic/Technician • Telecommunications Technician • Industrial Electronics Technician • Facilities Technician • Journeyman Engineer
College or university (bachelor's degree or higher)	• Electrical Engineer* • Telecommunications Engineer • Facilities Maintenance Engineer • Industrial Engineer • Instructor*

Environmental and Natural Science Engineering

Sample sequence of courses in the Environmental and Natural Science Engineering pathway:

CTE courses	Related courses
Introductory • Technology Core • Principles of Engineering • Introduction to Computers • Introduction to Drafting/CADD • Exploring Technology • Essentials of Environmental Engineering	• Physics • Chemistry • Biology • Geology • English Composition/ Writing • Trigonometry
Concentration • Computer Technology • Hydrology • Drafting and Computer-aided Design	
Capstone • Telecommunications • Electrical/Electronic Technology • Industrial Engineering Technology • Environmental Science and Technology	

Sample of appropriate foundation and pathway standards for the Essentials of Environmental Engineering course in the Environmental and Natural Science Engineering pathway:

Foundation standards	**Academics 1.1 Algebra I (grades eight through twelve) 5.0:** Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
	Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6: Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).
	Career Planning and Management 3.3: Develop a career plan that is designed to reflect career interests, pathways, and postsecondary options.
	Technology 4.1: Understand past, present, and future technological advances as they relate to a chosen pathway.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**ED E2.0:** Students study and understand the fundamentals of earth science as they relate to environmental engineering.
	ED E4.0: Students understand how the principles of force, work, rate, power, energy, and resistance relate to mechanical, electrical, fluid, and thermal engineering systems.
	ED E5.0: Students understand the design process and how to solve analyze and design problems.
	ED E7.0: Students understand how computer hardware and software are combined to create systems and process information and data.

Sample analysis ("unpacking") of a standard for the Essentials of Environmental Engineering course in the Environmental and Natural Science Engineering pathway:

Standard	**Engineering and Design E2.0:** Students study and understand the fundamentals of earth science as they relate to environmental engineering.	
Standard subcomponent	**Engineering and Design E2.5:** Use global positioning systems equipment and related technology to locate and evaluate soil or geological conditions or features.	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Basic global positioning systems (GPS) concepts 2. Equipment storage and operation procedures; maintenance and upkeep procedures 3. Soil and geological sampling concepts	*Benchmarks* 1. Students will be able to explain the fundamentals of the global positioning systems and tell how the satellite constellation is arranged to provide the signals necessary for accurate position reports. 2. Describe how to test, charge, or replace batteries and prepare equipment for proper and accurate operation. Explain how to store the equipment properly. 3. Describe how to record the GPS-obtained location of a soil sample and list three methods of determining the physical and chemical characteristics of that sample.
What should students be able to do? At what level?	*Skills* 1. How to set up global positioning systems 2. How to evaluate soil samples	*Benchmarks* 1. Complete a GPS system setup correctly under teacher's supervision. 2. Identify and evaluate at least three soil sample characteristics with 80 percent accuracy.
Topics and contexts **What must be taught?**	1. Basic knowledge of global positioning systems 2. Locating and identifying characteristics of soil and geological samples	

Sample Performance Task

Standards: This sample performance task targets the following Engineering and Design industry sector foundation and Environmental and Natural Science Engineering pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Algebra I (grades eight through twelve) 5.0	Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
Foundation: Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6	Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).

Standard number	Standards
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: ED E2.5	Use global positioning systems equipment and related technology to locate and evaluate soil or geological conditions or features.

Assignment: You will be part of a three-member team. Your team will discuss and prepare a plan to set up a global positioning system (GPS) to locate and evaluate soil or geological conditions or features, using the instruction sheet provided. Before you set up the system, you must:

1. Use research data provided by the teacher to brainstorm at least two procedures allowing for the use of GPS equipment to determine where soil, water, or geological samples are to be taken. Brainstorm two different methods of the GPS setup, using research data provided by the teacher (ED E2.5).
2. Discuss the GPS system's advantages and disadvantages, using calculations, measurements, and equations provided in the instruction sheet (ED E2.5; Academics 1.1 Algebra I [grades eight through twelve] 5.0).
3. Choose a system to set up (ED E2.5).
4. Prepare and deliver a five-minute presentation of a summary of the chosen setup system (Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 1.6).

Upon completion your team will be allowed to set up your global positioning system.

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
ED E2.5: Use global positioning systems equipment and related technology to locate and evaluate soil or geological conditions or features.	Both methods of GPS setup make optimal use of the research data provided. All advantages and disadvantages of each system for locating and evaluating soil or geological conditions are clearly evaluated, with reference to the relevant calculations and measurements. The selected system is perfectly appropriate for the given task.	The selected GPS setup makes good use of the research data provided. The advantages and disadvantages of the system for locating and evaluating soil or geological conditions are clearly evaluated, with reference to the relevant calculations and measurements. The selected system is appropriate for the given task.	The selected GPS setup makes minimal use of the research data provided. The advantages and disadvantages of each system for locating and evaluating soil or geological conditions are considered to a limited extent but not analyzed in depth.	The selected GPS setup does not make use of the research data provided or is inappropriate for the given task.

Standards	Advanced	Proficient	Basic	Unacceptable
Academics 1.1 Algebra 1 (grades eight through twelve) 5.0: Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.	One hundred percent of calculations, measurements, and solutions are accurate and meet professional standards.	Eighty percent of calculations, measurements, and solutions are correct.	Seventy percent of calculations, measurements, and solutions are correct.	Sixty percent or fewer of the calculations, measurements, and solutions are correct.
Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6: Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).	The presentation is complete, detailed, and well thought out and is commensurate with professional standards. Students explain the logic behind their selected setup method, with reference to the data and the advantages and disadvantages of both methods considered.	The presentation is complete and well thought out. Students explain the logic behind their selected setup method, with reference to the data and the advantages and disadvantages considered.	The presentation is incomplete or poorly organized. Students explain the logic behind their selected setup method but may not provide supporting evidence or information.	The presentation is incomplete and poorly organized. Students do not explain the logic behind the selected setup method.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of Pathway Occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Environmental and Natural Science Engineering Pathway Occupations	
High school (diploma)	• Environmental Sampling Assistant • Hazardous Material Remover • Environmental Engineering Aide • Environmental Apprentice
Postsecondary training (certification and/or AA degree)	• Environmental Sampling Technician • Survey-Mapping Technician • Environmental Engineering Technician • Environmental Planner Assistant • Journeyman Environmental Engineer
College or university (bachelor's degree or higher)	• Survey-Mapping Engineer • Environmental Engineer* • Environmental Planner* • Instructor*

Note

1. California Employment Development Department, *Industry Employment Projections, 2004–2014,* 2005. http://www.labormarketinfo.edd.ca.gov/egi/databrowsing/?PageID=145

Fashion and Interior Design Industry Sector

The Fashion and Interior Design industry sector is a multibillion-dollar enterprise offering a wide variety of careers. Highly sophisticated, it involves market research, brand licensing and intellectual property rights, design, materials engineering, product manufacturing, marketing, and distribution. According to the California Fashion Association, a particularly high demand exists for preproduction jobs involving computerized pattern making and product data management for larger companies. Contributing to the growth in the fashion industry's gross sales is a global focus on the Los Angeles lifestyle involving, for example, apparel, textiles, home furnishings, and furniture; the growing use of international sourcing; and the development of new technologies. And in the interior design industry, employment has been projected to grow by 12 percent through 2012 as demand rises for the interior design of private homes, offices, restaurants, facilities that care for the elderly, and a variety of retail establishments.[1]

This industry sector includes two interrelated pathways—(1) Fashion Design, Manufacturing, and Merchandising; and (2) Interior Design, Furnishings, and Maintenance. Each pathway consists of a coherent sequence of courses that begins with a foundation course, continues through one or more concentration courses, and concludes with a capstone course. Secondary-level instruction in high schools and regional occupational centers and programs is articulated with postsecondary educational programs in private training schools, community colleges, and four-year colleges and universities.

Fashion and Interior Design Industry Sector Pathways:

- Fashion Design, Manufacturing, and Merchandising
- Interior Design, Furnishings, and Maintenance

Fashion Design, Manufacturing, and Merchandising

Sample sequence of courses in the Fashion Design, Manufacturing, and Merchandising pathway:

CTE courses	Related courses
Introductory • Home Economics Careers and Technology Comprehensive Core I • Home Economics Careers and Technology Comprehensive Core II	• Economics • Art • Business • History
Concentration • Fashion, Textiles, and Apparel • Apparel Design and Construction	
Capstone • Careers in Fashion Design, Manufacturing, and Merchandising • Fashion Merchandising • Apparel Manufacturing and Production • Fashion History and Design	

Sample of appropriate foundation and pathway standards for the Fashion Merchandising course in the Fashion Design, Manufacturing, and Merchandising pathway:

Foundation standards

Academics 1.1 Number Sense (grade seven) 1.7: Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

Communications 2.1 Reading Comprehension (grades nine and ten) 2.3: Generate relevant questions about readings on issues that can be researched.

Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.5: Use language in natural, fresh, and vivid ways to establish a specific tone.

Communications 2.3 Listening and Speaking (grades nine and ten) 2.2: Deliver expository presentations:

a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives.
b. Convey information and ideas from primary and secondary sources accurately and coherently.
c. Make distinctions between the relative value and significance of specific data, facts, and ideas.
d. Include visual aids by employing appropriate technology to organize and display information on charts, maps, and graphs.
e. Anticipate and address the listener's potential misunderstandings, biases, and expectations.
f. Use technical terms and notations accurately.

Technical Knowledge and Skills 10.1: Understand how apparel and interior fashions meet social, physical, and psychological needs of individuals and families.

Foundation standards	**Technical Knowledge and Skills 10.2:** Understand the elements and principles of design and color theory as they apply to the selection of apparel, furnishings and housing.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**FID A1.0:** Students understand the main aspects of the fashion design, manufacturing, merchandising, and retail industry and the industry's role in local, state, and global economies.
	FID A4.0: Students understand and apply the elements and principles of design in various aspects of the fashion industry.
	FID A6.0: Students understand the characteristics, production, and maintenance of textiles and textile products.
	FID A7.0: Students understand how trends and color forecasting are used in the development of new lines.

Sample analysis ("unpacking") of a standard for the Fashion Merchandising course in the Fashion Design, Manufacturing, and Merchandising pathway:

Standard	**Fashion and Interior Design A7.0:** Students understand how trends and color forecasting are used in the development of new lines.	
Standard subcomponent	**Fashion and Interior Design A7.4:** Know the procedures for developing a line (e.g., researching trends and preparing sketches, color plates, and presentation boards).	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. The elements and principles of design 2. The levels of primary markets involved in design 3. The ultimate consumer market segment 4. Market trends 5. Merchandise categories or classifications	*Benchmarks* 1. List and define at least six of the basic elements and principles of design. 2. Cite and define the four levels of markets. 3. Identify the characteristics of the consumer for a given merchandising line. 4. Cite at least two examples of current predictions of market trends. 5. Cite four common apparel categories or classifications.
What should students be able to do? At what level?	*Skills* 1. How to create male and female croquis drawings 2. How to execute a cost analysis for a garment 3. How to create a merchandise line	*Benchmarks* 1. Illustrate a merchandise line composed of three to six unique croquis. 2. Calculate the cost of designing, creating, and selling three different garments, including wholesale and retail cost. 3. Incorporate all elements and principles of design into one unique merchandising line.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–5 2. Demonstrating on a spreadsheet a cost analysis of a garment 3. Creating and designing for different croquis 4. The principles and creation of merchandise lines	

Sample Performance Task

Standards: This sample performance task targets the following Fashion and Interior Design industry sector foundation standards and Fashion Design, Manufacturing, and Merchandising pathway standards:

Standard number	Standards
Foundation: Communications 2.3 Listening and Speaking (grades nine and ten) 2.2	Deliver expository presentations: a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives. b. Convey information and ideas from primary and secondary sources accurately and coherently. c. Make distinctions between the relative value and significance of specific data, facts, and ideas. d. Include visual aids by employing appropriate technology to organize and display information on charts, maps, and graphs. e. Anticipate and address the listener's potential misunderstandings, biases, and expectations. f. Use technical terms and notations accurately.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: FID A4.1	Understand the elements and principles of design and their interrelationships.
Pathway: FID A7.2	Research fashion and color trends.
Pathway: FID A7.4	Know the procedures for developing a line (e.g., researching trends and preparing sketches, color plates, and presentation boards).

Assignment: Design and illustrate a line of merchandise. The design should include at least three interrelated original fashion drawings, three or more fabric samples, and appropriate findings for each garment illustrated. In addition, identify all elements and principles of design for each garment and perform an overall cost analysis for each garment. You will:

1. Select a fashion season and research industry trends for the season selected. Show one picture and write a one-paragraph summary of each of the following sources at a minimum (FID A7.2):
   a. Two online sources (e.g., http://www.fashionshowroom.com)
   b. One retail specialty store (e.g., The Gap)
   c. One market segment source (e.g., *Women's Wear Daily*)
2. Design three garments to develop a unified line of merchandise, taking your research into account (FID A4.1; FID A7.4).
3. Prepare sketches for three fashion illustrations of your line (FID A7.4). Complete three separate croquis and mount them on a presentation board.
4. Identify eight to ten individual principles or elements of design for each garment (FID A4.1; FID A7.2; FID A7.4). Create a chart for each garment, denoting with a bullet point each principal or element of design, not to exceed one typed 8.5" × 11" page for each garment.

5. Identify, select, and procure fabric swatches for each garment design. Cut a two-inch square from each fabric and mount the squares on the presentation board, making sure that each square has a descriptive label that includes fiber content (FID A7.4).
6. Identify and select the findings (notions) for each garment design (FID A7.4). Mount each sample of your findings (notions) on the presentation board and label each one descriptively.
7. Create a spreadsheet, identifying each garment and providing an analysis of its cost. Include with each garment a half-page cost breakdown detailing wholesale and retail prices, allowances for defects and theft, and other considerations.
8. Compile on a presentation board all of the items previously described. Create and deliver an oral presentation, using note cards, to describe and explain all parts of your project (Communications 2.3 Listening and Speaking [grades nine and ten] 2.2). *Note:* The presentation board must be made of foam board and be of standard poster size, and all items must be attached to the board to be assessed accurately.

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
FID A4.1: Understand the elements and principles of design and their interrelationships.	Each garment has one page of bullet-point information for each element and principle of design, for a total of ten. The design of each garment is coherent and appealing and clearly displays the interrelationship of all design elements.	Each garment has one page of bullet-point information, with a minimum of eight elements and principles of design, for a total of eight. The design of each garment is coherent and displays the interrelationship of all design elements.	Each garment has one page of bullet-point information, with a minimum of seven elements and principles of design, for a total of seven. The design of each garment shows some understanding of the interrelationship of the design elements.	The individual garments do not have information pages. Or the pages discuss fewer than seven elements and principles of design. Or the information pages show no understanding of the interrelationship between the design elements.
FID A7.2: Research fashion and color trends.	At least five different sources were used and are clearly cited, with an illustration presented for each. At least two are online sources, one is a retail specialty store, and one is a market segment.	At least four different sources were used and are clearly cited, with an illustration presented for each. The sources are drawn from at least two of the three potential source types (online, retail specialty, and market segment).	At least three different sources were used and are clearly cited, with an illustration presented for each.	Fewer than three sources were cited. Or the citations are incorrect. Or no illustrations are provided.

Standards	Advanced	Proficient	Basic	Unacceptable
FID A7.4: Know the procedures for developing a line (e.g., researching trends and preparing sketches, color plates, and presentation boards).	The presentation board meets professional standards of appearance and has four or more sketches, a minimum of four fabric swatches, and some findings for each design. The designs are linked to the market research and create a coherent, consistent, appealing line that demonstrates clear understanding of all the procedures for developing a line.	The presentation board features three sketches, three fabric swatches, and some findings for each design. The designs are linked to the market research and demonstrate clear understanding of all the procedures for developing a line.	The presentation board features at least two sketches, two fabric swatches, and some findings for each design. The designs are linked to the market research or demonstrate basic understanding of all the procedures for developing a line.	The presentation board has fewer than three sketches, fewer than two fabric swatches, or no findings. The designs are not linked to market research and show limited or no understanding of the procedures for developing a line.
Communications 2.3 Listening and Speaking (grades nine and ten) 2.2: Deliver expository presentations.	The presentation is up to a professional standard. It is clear, entertaining, compelling, and convincing. The presentation includes accurate labels, concise information, and a thorough explanation of all project parts, including research strategies.	The presentation includes accurate labels, concise information, and a thorough explanation of most parts of the project, including the research strategies.	The presentation includes accurate labels, limited information, and a brief explanation of most parts of the project. Research strategies were not mentioned.	The presentation lacks accurate labels. Information presented is inadequate.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry.

Fashion Design, Manufacturing, and Merchandising Pathway Occupations	
High school (diploma)	• Sales Associate • Assistant Store Manager • Customer Service Provider • Showroom Assistant • Cutter
Postsecondary training (certification and/or AA degree)	• Fashion Illustrator • Visual Merchandiser • Fashion Buyer • Stylist • Sales Representative
College or university (bachelor's degree or higher)	• Fashion Designer • Fashion Journalist • Fashion Forecaster • Fashion Merchandise Manager • Operational Manager

Interior Design, Furnishings, and Maintenance

Sample sequence of courses in the Interior Design, Furnishings, and Maintenance pathway:

CTE courses	Related courses
Introductory • Home Economics Careers and Technology Comprehensive Core I • Home Economics Careers and Technology Comprehensive Core II	• Environmental Design • Housing and Furnishings • Art History • Computer Graphics or Computer-aided Design
Concentration • Environmental Design • Housing and Interior Design	
Capstone • Careers in Interior Design, Furnishings, and Maintenance • Interior Design	

Sample of appropriate foundation and pathway standards for the Interior Design course in the Interior Design, Furnishings, and Maintenance pathway:

Foundation standards

Academics 1.1 Number Sense (grade seven) 1.2: Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.3: Write expository compositions, including analytical essays and research reports:

a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives.
b. Convey information and ideas from primary and secondary sources accurately and coherently.
c. Make distinctions between the relative value and significance of specific data, facts, and ideas.
d. Include visual aids by employing appropriate technology to organize and display information on charts, maps, and graphs.
e. Anticipate and address the listener's potential misunderstandings, biases, and expectations.
f. Use technical terms and notations accurately.

Technology 4.4: Use appropriate technology in the chosen career pathway.

Leadership and Teamwork 9.0: Students understand effective leadership styles, key concepts of group dynamics, team and individual decision making, the benefits of workforce diversity, and conflict resolution.

Technical Knowledge and Skills 10.1: Understand how apparel and interior fashions meet social, physical, and psychological needs of individuals and families.

Technical Knowledge and Skills 10.9: Understand the principles and factors that influence space planning and interior design, including universal access.

Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards	**FID B3.0:** Students understand and apply the elements and principles of design to various aspects of the interior design industry.
	FID B5.0: Students understand and apply important aspects of space planning and know the characteristics of interior systems.
	FID B6.0: Students understand the selection of window, wall, and floor treatments.
	FID B10.0: Students understand the history and events that have influenced the design of furnishings.

Sample analysis ("unpacking") of a standard for the Interior Design course in the Interior Design, Furnishings, and Maintenance pathway:

Standard	**Fashion and Interior Design B5.0:** Students understand and apply important aspects of space planning and know the characteristics of interior systems.	
Standard subcomponent	**Fashion and Interior Design B5.4:** Use the correct scale and architectural symbols to draw interior spaces, including placement of doors, windows, and outlets.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. What an architectural scale is 2. What the architectural symbols are for doors, windows, and outlets 3. How room dimensions and wall widths affect furniture placement and electric, phone, and cable outlet placement	*Benchmarks* 1. Identify accurately all measurement marks on an architectural scale and describe its purpose. 2. Identify eight different window symbols, six different door symbols, and electric, phone, and cable outlet symbols. 3. Give three examples of how placement of furniture and utilities is affected by room dimensions and projected use.
What should students be able to do? At what level?	*Skills* 1. Read an architectural scale. 2. Convert feet and inches to scale. 3. Draw the various door, window, and outlet symbols. 4. Make informed decisions regarding placement of windows, doors, furniture, and utilities.	*Benchmarks* 1. Read an architectural scale with perfect accuracy. 2. Convert measurements to scale with 100 percent accuracy. 3. Draw correct door, window, and outlet symbols to scale with 100 percent accuracy. 4. Place furniture, windows, doors, and utilities in a drawing in appropriate locations for the given space.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–3 2. The importance of accuracy in drawing rooms 3. How to read and use architectural scale 4. How to decide what type of windows and doors to use in rooms of different dimensions and purpose 5. How placement of electric, phone, and cable outlets is dictated by the dimensions and uses of a space	

Sample Performance Task

Standards: This sample performance task targets the following Fashion and Interior Design industry sector foundation standards and Interior Design, Furnishings, and Maintenance pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Number Sense (grade seven) 1.2	Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
Foundation: Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.3	Write expository compositions, including analytical essays and research reports: a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives. b. Convey information and ideas from primary and secondary sources accurately and coherently. c. Make distinctions between the relative value and significance of specific data, facts, and ideas. d. Include visual aids by employing appropriate technology to organize and display information on charts, maps, and graphs. e. Anticipate and address the listener's potential misunderstandings, biases, and expectations. f. Use technical terms and notations accurately.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: FID B5.2	Interpret blueprints for accuracy and traffic flow and evaluate space for furniture placement and activities.
Pathway: FID B5.4	Use the correct scale and architectural symbols to draw interior spaces, including placement of doors, windows, and outlets.

Assignment: You will design a room layout as follows:

1. Use the standard architectural scale and follow along with the presentation on the overhead of the same architectural scale. Work with a partner to find and identify the following items on the scale (Academics 1.1 Number Sense [grade seven] 1.2; Technology 4.4):
   a. The side of the scale that measures 1/4 inch per foot
   b. The side of the scale that measures 1/2 inch per foot
   c. On the 1/4-inch scale, the measurement area for inches
   d. On the 1/4-inch scale, the measurement for eight feet
2. Draw the following measurements on your own paper, using the 1/4-inch scale:
   a. 6 feet, 6 inches
   b. 8 feet, 4 inches
   c. 7 feet
3. Use a 1/2-inch scale to draw the same measurements listed previously (Academics 1.1 Number Sense [grade seven] 1.2).

4. Use the handout to show the proper symbols for doors and windows and list the advantages and disadvantages of each type of window and door. On the handout with electrical, cable, and phone outlets, note where they are typically used in a room or house.
5. Use the 1/4-inch graph paper that you are given, a sharp pencil, and the architectural scale to create a detailed architectural drawing of the room that is sketched out with measurements on the overhead, including windows and doors placed where indicated. Show the measurements, identify the window and door styles, and indicate placement of electrical, cable, and phone outlets on the drawing (FID B5.4).
6. Use cutout templates to indicate on the floor plan where furniture will be arranged in the room, taking into account traffic flow and standard clearance spaces (FID B5.2).
7. Write a paragraph on the back of your graph paper, explaining your decisions regarding the styles of windows and doors, furniture placement, and placement of electrical, cable, and phone outlets (Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.3).

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
FID B5.2: Interpret blueprints for accuracy and traffic flow and evaluate space for furniture placement and activities.	In accord with universal design guidelines, ample clearance space is allowed. Furniture is grouped within activity areas so that traffic can flow through the room unimpeded.	In accord with universal design guidelines, all but one or two clearance spaces are sufficient. Furniture is grouped within activity areas, and traffic can flow through the room fairly easily.	In accord with universal design guidelines, all but three or four clearance spaces are adequate. Or furniture is not grouped within activity areas, and traffic flows through the room without major obstacles.	In accord with universal design guidelines, clearance spaces are not correct. Or furniture is not grouped within activity areas. Or traffic cannot flow through the room easily.
FID B5.4: Use the correct scale and architectural symbols to draw interior spaces, including placement of doors, windows, and outlets.	Room is drawn accurately to 1/4-inch scale. All symbols are drawn accurately and placed correctly in the room. All lines are straight and drawn in architectural scale.	Room is drawn accurately to 1/4-inch scale. All symbols are accurately drawn and correctly placed in the room. Most lines are straight.	Room is drawn accurately to 1/4-inch scale. Most symbols are drawn accurately and placed in the room. Lines may be crooked.	Room is not drawn to scale. Or not all symbols are drawn or accurately placed. Or lines are not straight.

Standards	Advanced	Proficient	Basic	Unacceptable
Academics 1.1 Number Sense (grade seven) 1.2: Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.	All measurements and conversions are precisely, accurately, and correctly performed.	All measurements and conversions are correctly and accurately performed, with a margin of error of plus or minus 5 percent.	All measurements and conversions are correctly performed, with a margin of error of plus or minus 10 percent.	Measurements and conversions are performed incorrectly or inaccurately or with errors in excess of plus or minus 10 percent.
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.3: Write expository compositions.	The paragraph is well written, with clear, concise explanations of all decisions made. The student correctly uses specialized terminology and appropriate vocabulary. The paragraph is professional in tone and content.	The paragraph is well written, with clear explanations of all decisions made. The student accurately uses some specialized terminology and appropriate vocabulary.	The paragraph adequately explains all or almost all of the decisions made. The student uses at least two technical terms appropriately.	The paragraph does not explain all or almost all of the decisions made. Or the explanations are not clear. Or the language is too basic, nontechnical, or otherwise inappropriate for the task. Or technical terms are used incorrectly.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Interior Design, Furnishings, and Maintenance Pathway Occupations	
High school (diploma)	• Retail Sales Associate • Design Assistant • Sales Representative • Trade Intern (various occupations) • Set Decorator
Postsecondary training (certification and/or AA degree)	• Visual Merchandiser • CAD Specialist • Facility and Space Planner • Assistant Designer
College or university (bachelor's degree or higher)	• Interior Designer • Ergonomic Consultant • Preservationist • Lighting Specialist* • Certified Kitchen or Bath Specialist*

Note

1. Bureau of Labor Statistics, U.S. Department of Labor, "The 2004–14 Job Outlook in Brief," *Occupational Outlook Quarterly* (Spring 2006). http://www.bls.gov/opub/ooq/2006/spring/contents.htm

Finance and Business Industry Sector

The Finance and Business industry sector, a vital contributor to the U.S. economy, employs more than six million people in related occupations. In all areas of this sector, advances in technology and trends toward direct marketing provide for many fast-growing career opportunities. For example, employment of accountants and auditors is expected to grow at a rate about equal to the average for all other occupations, and career opportunities in banking are expected to increase at a greater rate than normal as a result of the expansion of banking and investment institutions. Because of market globalization and an increasing demand for investment advice, employment in financial management will also continue to grow.[1]

The sector includes three pathways. Accounting Services provides instruction in developing and utilizing general accounting systems; Banking and Related Services focuses on the fundamentals of lending and banking regulations; and Business Financial Management helps develop skills in investment analysis and guidance. Students interested in pursuing one or more of these pathways should develop knowledge and skills in mathematics, communications, and technology.

Finance and Business Industry Sector Pathways:

- Accounting Services
- Banking and Related Services
- Business Financial Management

Accounting Services

Sample sequence of courses in the Accounting Services pathway:

CTE courses	Related courses
Introductory • Business Communications • Computer Applications • Exploratory Business • Financial Literacy • Keyboarding	• Economics • Statistics
Concentration • Accounting I and II • Computer Accounting • Recordkeeping	
Capstone • Entrepreneurship • Internship • Virtual Enterprise • Volunteer Income Tax Assistance	

Sample of appropriate foundation and pathway standards for the Accounting I course in the Accounting Services pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.2:** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
	Academics 1.1 Number Sense (grade seven) 1.3: Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
	Academics 1.1 Number Sense (grade seven) 1.6: Calculate the percentage of increases and decreases of a quantity.
	Academics 1.1 Number Sense (grade seven) 1.7: Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.
	Academics 1.1 Mathematical Reasoning (grade seven) 1.1: Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
	Technology 4.0: Students know how to use contemporary and emerging technological resources in diverse and changing personal, community, and workplace environments.
	Technology 4.2: Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.
	Technical Knowledge and Skills 10.0: Students understand the essential knowledge and skills common to all pathways in the Finance and Business sector.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards	
	FB A1.0: Students understand the basic principles and procedures of the accounting cycle.
	FB A2.0: Students understand and apply accounting principles and concepts.
	FB A3.0: Students understand governing agencies and the typical development and structure of various business environments.
	FB A4.0: Students understand how basic principles of internal control systems relate to the accounting cycle.

Sample analysis ("unpacking") of a standard for the Accounting I course in the Accounting Services pathway:

Standard	**Finance and Business A1.0:** Students understand the basic principles and procedures of the accounting cycle.	
Standard subcomponent	**Finance and Business A1.2:** Examine, analyze, and categorize financial transactions.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Purpose of double-entry (DE) accounting 2. Benefits to an individual company from DE accounting 3. Key elements of DE accounting	*Benchmarks* 1. Cite two basic purposes of DE accounting. 2. Cite three benefits of DE accounting. 3. Define the four key elements.
What should students be able to do? At what level?	*Skills* 1. How to structure accounts 2. How to prove balances correctly 3. How to journalize transactions for a service business	*Benchmarks* 1. Structure correctly a basic DE account system. 2. Balance accounts accurately (no more than one error). 3. Journalize correctly transactions to assets, liabilities, owner's equity, revenue, expenses, and withdrawals.
Topics and contexts **What must be taught?**	1. Basic double-entry accounting concepts 2. Construction of a double-entry accounting journal 3. Proving journal pages for balance 4. Correctly entering data on a journal page	

Sample Performance Task

Standards: This sample performance task targets the following Finance and Business industry sector foundation standards and Accounting Services pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Number Sense (grade seven) 1.2	Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

Standard number	Standards
Foundation: Technology 4.2	Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: FB A1.4	Prepare, analyze, and interpret financial statements for various business entities.
Pathway: FB A2.2	Apply appropriate concepts and techniques to account for equity investments and withdrawals for sole proprietorships, partnerships, and corporations.

Assignment: Your cooperative learning group will receive a list of 25 financial transactions, including equity investments and withdrawals. In your group you will:

1. Design an electronic spreadsheet (Technology 4.2).
2. Design a journal page according to standard accounting practice (FB A1.4, FB A2.2).
3. Enter the given accounting transactions in correct journal format (FB A1.4).
4. Prove balances by the hand method (Academics 1.1 Mathematics Number Sense [grade seven] 1.20).
5. Submit the final products.

You will also assess the product of another group.

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
FB A1.4: Prepare, analyze, and interpret financial statements for various business entities. (40 points)	Uses accounting forms and inputs transactions with 100 percent accuracy. (40 points)	Uses accounting forms correctly, with a few incidental errors in data entry. (35 points)	Does not demonstrate correct use of accounting forms and has multiple errors in data entry. (20 points)	Does not have knowledge of accounting forms and is unable to enter data correctly. (0 points)
FB A2.2: Apply appropriate concepts and techniques to account for equity investments and withdrawals for sole proprietorships, partnerships, and corporations. (30 points)	Records of transactions of the business are kept that reflect chronological order of transactions and are completely accurate. Debits and credits are in balance throughout. (30 points)	Debits and credits are recorded. Some degree of confusion in interpretation of transactions to debit and credit format. May have a column out of balance. (25 points)	Difficulty with journalizing transactions in debit and credit format reflects lack of understanding. (10 points)	Does not understand the concept and purpose of double-entry accounting. Not able to journalize. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Academics 1.1 Number Sense (grade seven) 1.2: Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers. (25 points)	Transactions are added and subtracted accurately to maintain balanced transactions with 100 percent accuracy. (25 points)	Transactions are added and subtracted to maintain balanced transactions with no more than one error. (20 points)	Transactions are added and subtracted to maintain balanced transactions with no more than two errors. (10 points)	Transactions are not added and subtracted accurately. (0 points)
Technology 4.2: Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services. (25 points)	Able to operate an electronic spreadsheet to input journal data and maintain appropriate balances. Able to design spreadsheets needed. (25 points)	Able to operate an electronic spreadsheet. Able to maintain balances and totals. Unable to design spreadsheets. (20 points)	Able to input data on an electronic spreadsheet. (10 pts)	Does not understand nor is able to use a spreadsheet for accounting functions required. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Accounting Services Pathway Occupations	
High school (diploma)	• Account Clerk • Audit Clerk • Bookkeeper • Payroll Clerk
Postsecondary training (certification and/or AA degree)	• Account Specialist • Cost Estimator • Tax Preparer
College or university (bachelor's degree or higher)	• Accountant* • Auditor • Budget Analyst • Controller

Banking and Related Services

Sample sequence of courses in the Banking and Related Services pathway:

CTE courses	Related courses
Introductory • Business Communications • Computer Applications • Exploratory Business • Financial Literacy • Keyboarding	• Economics • Multicultural Relations • Psychology
Concentration • Accounting • Financial Services • Banking • Money and Banking	
Capstone • Business Law • Business Statistics • Virtual Enterprise • Entrepreneurship	

Sample of appropriate foundation and pathway standards for the Money and Banking course in the Banking and Related Services pathway:

Foundation standards

Academics 1.1 Number Sense (grade seven) 1.2: Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

Academics 1.1 Number Sense (grade seven) 1.6: Calculate the percentage of increases and decreases of a quantity.

Communications 2.1 Reading Comprehension (grades nine and ten) 2.1: Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purposes.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 1.3: Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.5: Write business letters:

a. Provide clear and purposeful information and address the intended audience appropriately.
b. Use appropriate vocabulary, tone, and style to take into account the nature of the relationship with, and the knowledge and interests of, the recipients.
c. Highlight central ideas or images.
d. Follow a conventional style with page formats, fonts, and spacing that contribute to the documents' readability and impact.

Technology 4.0: Students know how to use contemporary and emerging technological resources in diverse and changing personal, community, and workplace environments.

Foundation standards	**Technical Knowledge and Skills 10.0:** Students understand the essential knowledge and skills common to all pathways in the Finance and Business sector.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**FB B1.0:** Students understand the concepts involved in providing customer service in banking and related services.
	FB B2.0: Students understand the key operations and management of banking and related services.
	FB B3.0: Students understand the regulatory compliance of banking and related services.

Sample analysis ("unpacking") of a standard for the Money and Banking course in the Banking and Related Services pathway:

Standard	**Finance and Business B1.0:** Students understand the concepts involved in providing customer service in banking and related services.	
Standard subcomponent	**Finance and Business B1.2:** Understand the nature and demands of professionalism in working relationships with customers and employees.	
Course level	❑ Introductory ☒ Concentration ❑ Capstone	
What do students need to know? At what level?	*Concepts* 1. Professional conduct with customers 2. Customer relations strategies 3. Professional employee relationships	*Benchmarks* 1. Cite four examples of professional conduct. 2. Describe and demonstrate four customer relations strategies. 3. Cite two examples of productive professional employee relationships.
What should students be able to do? At what level?	*Skills* 1. How to work as a team to solve problems 2. How to demonstrate professional behavior with customers	*Benchmarks* 1. Demonstration includes at least two examples of teamwork. 2. Demonstration includes at least three examples of professional behavior.
Topics and contexts **What must be taught?**	1. Fundamentals of professional customer relations 2. Components of successful teamwork and professional employee relationships	

Sample Performance Task

Standards: This sample performance task targets the following Finance and Business industry sector foundation standards and Banking and Related Services pathway standards:

Standard number	Standards
Foundation: Communications 2.2 Writing Strategies and Applications (grades nine and ten) 1.3	Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources.

Standard number	Standards
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: FB B1.1	Employ technical skills to perform teller functions, data processing functions, new-account functions, and lending functions.
Pathway: FB B1.2	Understand the nature and demands of professionalism in working relationships with customers and employees.
Pathway: FB B1.3	Demonstrate basic selling techniques to assist customers in making an informed buying decision.

Assignment: As part of a collaborative work group, you will work on a customer development team. Within this simulation you will:

1. Become familiar with a variety of banking instruments and their accompanying documentation (FB B1.1).
2. Work in teams. Students will interview hypothetical potential bank customers to develop new accounts with various levels of investment (FB B 1.1; FB B1.2; FB B1.3; Communications 2.2 Writing Strategies and Applications [grades nine and ten] 1.3).
3. Use correct forms and applications. Students will complete necessary forms to create customer accounts (FB 1.1).

At the conclusion of the simulations, students will compose a 500-word group report that analyzes the activity, citing successes and failures and apparent reasons for both.

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
FB B1.1: Employ technical skills to perform teller functions, data processing functions, new-account functions, and lending functions (35 points)	Is able to lead or instruct others in regard to these functions. (35 points)	Is able to perform teller tasks and functions involving new accounts. (30 points)	Understands teller and account functions but is unable to perform them routinely. (20 points)	Does not understand teller functions or account functions. (0 points)
FB B1.2: Understand the nature and demands of professionalism in working relationships with customers and employees. (25 points)	Demonstrates professionalism in working with customers and coworkers in at least 80 percent of problem-solving situations. (25 points)	Demonstrates professionalism in working with customers and coworkers in 51 to 79 percent of problem-solving situations. (20 points)	Demonstrates professionalism in working with customers and coworkers in 25 to 50 percent of problem-solving situations. (10 points)	Is unable to deal with customers and coworkers. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
FB B1.3: Demonstrate basic selling techniques to assist customers in making an informed buying decision. (30 points)	Is able to relate to and sell appropriate products to customers at all times. (30 points)	Is able to work with customers to guide investment in appropriate bank products 90 percent of the time. (25 points)	Is able at times to communicate investment options effectively to customers. May not be conversant with products. (15 points)	Has minimal knowledge of products and lacks ability to convey ideas to customers. (0 points)
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 1.3: Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources. (25 points)	All interview questions are well phrased, nonduplicative, thorough, and comprehensive to elicit required information. (25 points)	All interview questions are adequately phrased, nonduplicative, and comprehensive to elicit required information. (20 points)	Most interview questions are adequately phrased to elicit required information. (10 points)	Most interview questions are not adequately phrased to elicit required information. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry.

Banking and Related Services Pathway Occupations	
High school (diploma)	• Account Collector • Bank Teller • New Accounts Clerk • Credit Clerk
Postsecondary training (certification and/or AA degree)	• Actuary • Loan Specialist • Customer Service Representative • Credit Analyst
College or university (bachelor's degree or higher)	• Appraiser • Bank Manager • Credit Manager • Escrow Officer • Internal Auditor

Business Financial Management

Sample sequence of courses in the Business Financial Management pathway:

CTE courses	Related courses
Introductory • Business Communication • Computer Applications • Exploratory Business • Financial Literacy • Introduction to Business	• Economics • Statistics • Banking
Concentration • Marketing • Accounting • Financial Occupations • Stocks, Bonds, and Investments • Insurance Services	
Capstone • Business Statistics • Financial Management • Virtual Enterprise • Entrepreneurship	

Sample of appropriate foundation and pathway standards for the Business Statistics course in the Business Financial Management pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.1:** Read, write, and compare rational numbers in scientific notation (positive and negative powers of ten) with approximate numbers, using scientific notation.
	Academics 1.1 Number Sense (grade seven) 1.2: Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
	Academics 1.1 Number Sense (grade seven) 1.6: Calculate the percentage of increases and decreases of a quantity.
	Academics 1.1 Number Sense (grade seven) 1.7: Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.
	Technology 4.0: Students know how to use contemporary and emerging technological resources in diverse and changing personal, community, and workplace environments.
	Problem Solving and Critical Thinking 5.0: Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques.
	Problem Solving and Critical Thinking 5.1: Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
	Technical Knowledge and Skills 10.0: Students understand the essential knowledge and skills common to all pathways in the Finance and Business sector.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards	**FB C1.0:** Students create and use budgets to guide financial decision making.
	FB C2.0: Students know how to analyze and interpret financial data.
	FB C3.0: Students understand the impact of federal, state, and local regulations on financial management decisions.

Sample analysis ("unpacking") of a standard for the Business Statistics course in the Business Financial Management pathway:

Standard	**Finance and Business C1.0:** Students create and use budgets to guide financial decision making.	
Standard subcomponent	**Finance and Business C1.2:** Analyze past and current budgets to determine financial business needs	
Course level	❑ Introductory ❑ Concentration ☒ Capstone	
What do students need to know? At what level?	*Concepts* 1. What a budget demonstrates 2. Reasons for using budgets 3. Use of budgets to draw conclusions and make predictions 4. Use of budgets to determine appropriate investments 5. Use of budgets as to tax implications of investment decisions	*Benchmarks* 1. Provide basic definition of a *budget.* 2. Cite three benefits of budgets. 3. Describe the type of conclusions that may be drawn from budgets. 4. Cite three investment options derived from budgets. 5. Describe the tax implications of the three investment options.
What should students be able to do? At what level?	*Skills* 1. How to develop a budget 2. How to draw conclusions from budget data 3. Making investment decisions based on budgets	*Benchmarks* 1. List and explain the parts of a budget. 2. Interpret budget information and provide findings in usable format from example provided. 3. Specify appropriate investments from a variety of choices.
Topics and contexts **What must be taught?**	1. Components of the budget 2. Composition of budgets 3. Process to draw conclusions from budgets 4. Investment vehicles and appropriateness in relation to budget	

Sample Performance Task

Standards: This sample performance task targets the following Finance and Business industry sector foundation standards and Business Financial Management pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Number Sense (grade seven) 1.6	Calculate the percentage of increases and decreases of a quantity.
Foundation: Problem Solving and Critical Thinking 5.1	Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Standard number	Standards
Pathway: FB C1.1	Create a budget to calculate long-term projections.
Pathway: FB C1.2	Analyze past and current budgets to determine financial business needs.
Pathway: FB C2.1	Use basic concepts of financial analysis to interpret financial statements.

Assignment: In partnership groups of two, you will:

1. Receive raw (unformatted) financial data for a small business (FB C1.2).
2. Organize the data in a budget format (FB C1.1; Problem Solving and Critical Thinking 5.1).
3. Draw conclusions about the financial condition of this business, using percentages for each budget category (FB C2.1; Academics 1.1 Number Sense [grade seven] 1.6).
4. Write a 250-word paper to present your findings and make recommendations on investments that are appropriate to the financial condition of this business. Submit the budget with the paper.

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
FB C1.1: Create a budget to calculate long-term projections. (25 points)	Uses correct budget format, inputs data with 100 percent accuracy, and draws conclusions about long-term investment needs. (25 points)	Uses correct budget format, inputs data with 90 percent accuracy, and may draw conclusions about investment needs. (20 points)	Inputs data in a preformatted budget. Is unable to draw conclusions about investment needs. (10 points)	Is unable to understand or use a budget. (0 points)
FB C1.2: Analyze past and current budgets to determine financial business needs. (25 points)	Chooses appropriate investment options from budget data. (25 points)	Can analyze budget data but has trouble with correct investment. (20 points)	Understands the need to analyze budgets to make investment decisions. Can describe the process. (10 points)	Has no understanding of budget analysis process. (0 points)
FB C2.1: Use basic concepts of financial analysis to interpret financial statements. (25 points)	Is able to analyze and draw conclusions from budget data. No assistance required. (25 points)	Is able with guidance to draw conclusions from budget data. (15 points)	Understands the purpose of budgets but unable to use them productively. (5 points)	Has no ability to analyze a budget. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Academics 1.1 Number Sense (grade seven) 1.6: Calculate the percentage of increases and decreases of a quantity. (20 points)	Percentages are calculated 100 percent accurately for each budget category. (20 points)	Percentages are calculated accurately, with no more than one error in any budget category. (15 points)	Percentages are calculated accurately, with no more than two errors in any budget category. (10 points)	Percentages are incorrectly calculated for budget categories. (0 points)
Problem Solving and Critical Thinking 5.1: Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks (20 points)	Determines correct format for the budget and correctly identifies categories for each budget item. (20 points)	Determines format for the budget and identifies categories for each budget item, with only one error. (15 points)	Determines format for the budget and identifies categories for each budget item, with no mre than two errors. (10 points)	Is unable to determine correct format for the budget and identify categories for budget items correctly. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry.

Business Financial Management Pathway Occupations	
High school (diploma)	• Claims Clerk • Collector • Insurance Appraiser
Postsecondary training (certification and/or AA degree)	• Claims Examiner • Tax Examiner • Treasurer • Underwriting Assistant
College or university (bachelor's degree or higher)	• Budget Analyst • Finance Director • Economist • Financial Planner • Securities Manager

Note

1. California Employment Development Department, *California Industry Employment Projections 2004–2014,* 2005. http://www.labormarketinfo.edd.ca.gov/egi/databrowsing/?PageID=145

Health Science and Medical Technology Industry Sector

Health Science and Medical Technology continues to be one of the fastest-growing industry sectors in California, offering numerous opportunities and benefits. Of the more than 300 careers within this sector, about 41 percent require professional-level preparation; about 33 percent, technical-level preparation; and 26 percent, assistant-level preparation. The Health Science and Medical Technology pathways and careers offer options to match a variety of the aptitudes, interests, abilities, and academic achievement of students. Wages and salaries are projected to increase by 27 percent through 2014, and employment is expected to account for about 3.6 million new jobs—19 percent of all jobs to be added to the economy by 2014.[1]

The career pathways are grouped in functions that have a common purpose and similar attributes: Biotechnology Research and Development, Diagnostic Services, Health Informatics, Support Services, and Therapeutic Services. Standards for each career path build on and continue the Health Science and Medical Technology foundation standards, providing more complexity, rigor, and career specificity. And each career pathway includes standards needed for all careers within that pathway.

Health Science and Medical Technology Industry Pathways:

- Biotechnology Research and Development
- Diagnostic Services
- Health Informatics
- Support Services
- Therapeutic Services

Biotechnology Research and Development

Sample sequence of courses in the Biotechnology Research and Development pathway:

CTE courses	Related courses
Introductory • Introduction to Health Careers I • Introduction to Health Careers II	• Biology • Microbiology • Chemistry • Biochemistry • Anatomy and Physiology • Math Analysis • Algebra I • Algebra II
Concentration • Introduction to Biotechnology I • Medical Terminology • Structure and Function	
Capstone • Introduction to Biotechnology II • Biotechnology Assistant • Biotechnology Technician	

Sample of appropriate foundation and pathway standards for the Introduction to Health Careers I course in the Biotechnology Research and Development pathway:

Foundation standards

Academics 1.3 United States History and Geography: Continuity and Change in the Twentieth Century (grade eleven) 11.11.6: Analyze the persistence of poverty and how different analyses of this issue influence welfare reform, health insurance reform, and other social policies.

Communications 2.4 Listening and Speaking Applications (grades nine and ten) 2.5: Deliver persuasive arguments (including evaluation and analysis of problems and solutions and causes and effects):

a. Structure ideas and arguments in a coherent, logical fashion.
b. Use rhetorical devices to support assertions (e.g., by appeal to logic through reasoning; by appeal to emotion or ethical belief; by use of personal anecdote, case study, or analogy).
c. Clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, expressions of commonly accepted beliefs, and logical reasoning.
d. Anticipate and address the listener's concerns and counterarguments.

Ethics and Legal Responsibilities 8.3: Understand the role of personal integrity and ethical behavior in the workplace.

Ethics and Legal Responsibilities 8.4: Understand the ways in which ethical considerations affect emerging technologies and their impact on society.

Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.

Leadership and Teamwork 9.5: Understand how to interact with others in ways that demonstrate respect for individual and cultural differences and for the attitudes and feelings of others.

Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards	**HSMT A1.0:** Students know the role of the biotechnology industry and biotechnology product development in curing diseases.
	HSMT A6.0: Students understand the ethical, moral, legal, and cultural issues related to the use of biotechnology research and product development.

Sample analysis ("unpacking") of a standard for the Introduction to Health Careers I course in the Biotechnology Research and Development pathway:

Standard	**Health Sciences and Medical Technology A6.0:** Students understand the ethical, moral, legal, and cultural issues related to the use of biotechnology research and product development.	
Standard subcomponent	**Health Sciences and Medical Technology A6.1:** Understand the relationship between morality and ethics in the development of biotechnology health care products.	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Ethics of biomedical issues and products 2. Various roles of health care professionals related to biomedical issues and products 3. Listing and definitions of controversial bioethical issues and products 4. Ability to cite working definitions of *morality* and *ethics*	*Benchmarks* 1. List at least two ethical issues related to three areas of biotechnology research or product development. 2. Explain how the roles of three health care professionals would relate to decision making about bioethical issues or products. 3. List five controversial bioethical issues or products. 4. Give basic definitions of *ethics* and *morality* as they are applied in biotechnology.
Topics and contexts **What must be taught?**	Basic knowledge of preceding concepts 1–4	

Sample Performance Task

Standards: This sample performance task targets the following Health Science and Medical Technology industry sector foundation standards and Biotechnology Research and Development pathway standards:

Standard number	Standards
Foundation: Communications 2.4 Listening and Speaking Applications (grades nine and ten) 2.5	Deliver persuasive arguments (including evaluation and analysis of problems and solutions and causes and effects): a. Structure ideas and arguments in a coherent, logical fashion. b. Use rhetorical devices to support assertions (e.g., by appeal to logic through reasoning; by appeal to emotion or ethical belief; by use of personal anecdote, case study, or analogy). c. Defend positions with precise and relevant evidence, including facts, expert opinions, quotations, expressions of commonly accepted beliefs, and logical reasoning. d. Anticipate and address the listener's concerns and counterarguments.

Standard number	Standards
Foundation: Ethics and Legal Responsibilities 8.3	Understand the role of personal integrity and ethical behavior in the workplace.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: HSMT A6.0	Students understand the ethical, moral, legal, and cultural issues related to the use of biotechnology research and product development.
Pathway: HSMT A6.1	Understand the relationship between morality and ethics in the development of biotechnology health care products.

Assignment: **Bioethical Research and Debate**

As part of a team of three or four students, research an open-ended controversial bioethical issue, such as euthanasia, medical marijuana, cloning, in vitro fertilization, or organ transplants, and then participate in a biotechnology debate on that issue. In this assignment you are to:

1. Work with the teacher to form teams of three or four students interested in the same topic, with two teams working on each topic (Leadership and Teamwork 9.3).
2. Work with your group to develop a research plan including at least eight sources that will generate data and opinions on both sides of the issue. Assign very clear and equal tasks to each team member. Have the research plan approved by the teacher (Leadership and Teamwork 9.3).
3. Carry out your research plan, ensuring that you get ample information on all sides of the issue (HSMT A6.0; HSMT A6.1; Ethics and Legal Responsibilities 8.3; Demonstration and Application 11.0).
4. Meet with the other team that has researched the same topic. Flip a coin to see which team will represent the pro side and which the con side (Leadership and Teamwork 9.3).
5. Develop your debate plan and speeches, including your opening and closing speeches and preparation for your rebuttal, after the teacher has handed out information on the structure of the debate, the time limits for presentations, and so forth (Communications 2.4 Listening and Speaking [grades nine and ten] 2.5; Leadership and Teamwork 9.3).
6. Present your debate to the class for judging. Each class member will complete an evaluation form indicating the persuasiveness of your argument (Communications 2.4 Listening and Speaking [grades nine and ten] 2.5).
7. Engage, when all presentations are completed, in a full class discussion of the roles of health care professionals and possible implications and outcomes of the issue affecting careers in Health Science (HSMT A6.0; HSMT A6.1; Ethics and Legal Responsibilities 8.3).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
HSMT A6.0: Students understand the ethical, moral, legal, and cultural issues related to the use of biotechnology research and product development. (30 points)	Student clearly understands and articulates the ways in which ethical and moral considerations relate to both sides of the argument regarding bioethical issues. The nuances and gray areas are acknowledged and creatively addressed. (26–30 points)	Student adequately understands and articulates the ways in which ethical and moral considerations relate to both sides of the argument regarding bioethical issues. (21–25 points)	Student appears to understand the ways in which ethical and moral considerations relate to both sides of the argument regarding bioethical issues but may have problems articulating or understanding them or eliminating personal bias. (16–20 points)	Student does not understand and/or cannot articulate the ways in which ethical and moral considerations relate to both sides of the argument regarding bioethical issues. (0 points)
HSMT A6.1: Understand the relationship between morality and ethics in the development of biotechnology healthcare products. (5 points)	Student makes specific references to the morality and ethics of biotechnology health care products related to the bioethical issue being discussed. Student predicts future technological developments in the field and discusses their moral and ethical implications. (5 points)	Student makes specific references to the morality and ethics of biotechnology health care products related to the bioethical issue being discussed. (4 points)	Student mentions the morality and ethics of biotechnology health care products related to the bioethical issue being discussed. (2 points)	Student does not discuss biotechnology health care products. (0 points)
Communications 2.4 Listening and Speaking Applications (grades nine and ten) 2.5: Deliver persuasive arguments (including evaluation and analysis of problems and solutions and causes and effects). (30 points)	Student fully researches topic and cites more than eight sources from a variety of research methods. Student delivers persuasive argument in a coherent, logical fashion, using supporting assertions with precise and relevant evidence. Student anticipates and addresses the opposition's arguments and presents logical, viable counterarguments to build listener consensus. (30 points)	Student does adequate research on topic and cites at least eight sources. Student delivers somewhat persuasive argument in a coherent, logical fashion, using supporting assertions with evidence. Student anticipates and addresses some of the opposition's arguments and presents counterarguments to build listener consensus. (20 points)	Student does minimal research on topic and cites five to eight sources. Student delivers minimally persuasive argument, using supporting assertions with some evidence. Student anticipates and addresses a few of the opposition's arguments and presents minimal counterarguments to build listener consensus. (10 points)	Student does not research topic or cites fewer than five sources. Student does not deliver persuasive argument and has no supporting assertions or evidence. Student does not anticipate and address the opposition's arguments or build listener consensus. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Ethics and Responsibility 8.3: Understand the role of personal integrity and ethical behavior in the workplace. (30 points)	During debate and classwide discussion, student displays a nuanced and in-depth understanding of integrity and ethical behavior in the workplace and applies this knowledge logically and creatively to various examples and scenarios. (30 points)	During debate and classwide discussion, student displays an adequate understanding of integrity and ethical behavior in the workplace and applies this knowledge to one or two well-chosen examples or scenarios. (20 points)	During debate and classwide discussion, student displays a basic understanding of integrity and ethical behavior in the workplace and cites at least one example or hypothetical scenario. (15 points)	During debate and classwide discussion, student shows limited or no understanding of integrity and ethical behavior in the workplace. (0 points)
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals. (5 points)	Student works effectively on a team, displaying an understanding of group dynamics and the principles of leadership. Work is evenly distributed. Student completes a full share of the work. (5 points)	Student works adequately on a team, displaying an understanding of group dynamics. Student completes a full share of the work. (4 points)	Student works minimally effectively on a team and avoids including teammates in the work. The student completes less than a full share of the work. (3 points)	Student works independently of team. Or student actively or passively disrupts the team's work. Or student does less than half a share of the work. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of Pathway Occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Biotechnology Research and Development Pathway Occupations	
High school (diploma)	• Biotechnology Assistant
Postsecondary training (certification and/or AA degree)	• Biotechnology Technician* • Biomedical Technician* • Quality Assurance/Control Technician*
College or university (bachelor's degree or higher)	• Biotechnology Scientist* • Bioinformatics Specialist* • Biomedical Chemist* • Biostatistician* • Clinical Trials Researcher*

Diagnostic Services

Sample sequence of courses in the Diagnostic Services pathway:

CTE courses	Related courses
Introductory • Introduction to Health Careers I • Introduction to Health Careers II • Hospital Occupations • Introduction to Imagery I	• Anatomy and Physiology • Chemistry • Food and Nutrition • Technical Writing • Psychology • Mathematics Analysis and Calculus • Physics • Foreign Language • Computer Applications
Concentration • Medical Terminology • Health: Biological Structure and Function	
Capstone • Medical Laboratory Assistant • Radiology Assistant • Bioengineering Assistant	

Sample of appropriate foundation and pathway standards for the Introduction to Imagery I course in the Diagnostic Services pathway:

Foundation standards	**Academics 1.1 Measurement and Geometry (grade seven) 1.1:** Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (e.g., miles per hour and feet per second, cubic inches to cubic centimeters).
	Academics 1.1 Mathematical Reasoning (grade seven) 1.1: Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
	Academics 1.2 Focus on Life Sciences (grade seven) 1.a: Students know cells function similarly in all living organisms.
	Academics 1.2 Focus on Life Sciences (grade seven) 5.b: Students know organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system.
	Academics 1.2 Biology/Life Sciences (grades nine through twelve) 10.a: Students know the role of the skin in providing nonspecific defenses against infection.
	Academics 1.2 Biology/Life Sciences (grades nine through twelve) 10.b: Students know the role of antibodies in the body's response to infection.
	Academics 1.3 United States History and Geography (grade eleven) 11.8.1: Trace the growth of service sector, white collar, and professional sector jobs in business and government.
	Academics 1.3 United States History and Geography (grade eleven) 11.11.3: Describe the changing roles of women in society as reflected in the entry of more women into the labor force and the changing family structure.
	Communications 2.1 Reading Comprehension (grades eleven and twelve) 1.2: Apply knowledge of Greek, Latin, and Anglo-Saxon roots and affixes to draw inferences concerning the meaning of scientific and mathematical terminology.

Foundation standards

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 1.5: Synthesize information from multiple sources and identify complexities and discrepancies in the information and the different perspectives found in each medium (e.g., almanacs, microfiche, news sources, in-death field studies speeches, journals, technical documents).

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting):

a. Report information and convey ideas logically and correctly.
b. Offer detailed and accurate specifications.
c. Include scenarios, definitions, and examples to aid comprehension (e.g., trouble-shooting guide).
d. Anticipate readers' problems, mistakes, and misunderstandings.

Communications 2.4 Listening and Speaking Applications (grades nine and ten) 2.1: Deliver narrative presentations:

a. Narrate a sequence of events and communicate their significance to the audience.
b. Locate scenes and incidents in specific places.
c. Describe with concrete sensory details the sights, sounds, and smells of a scene and the specific actions, movements, gestures, and feelings of characters.
e. Pace the presentation of actions to accommodate time or mood changes.

Technology 4.2: Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.

Technology 4.5: Know how to interpret technical materials and medical instrumentation used for health care practices and policies.

Problem Solving and Critical Thinking 5.3: Examine multiple options for completing work tasks by applying appropriate problem-solving strategies and critical thinking skills to work-related issues.

Ethics and Legal Responsibilities 8.5: Understand and maintain the Patients' Bill of Rights, patients' and clients' confidentiality, and the Health Insurance Portability and Accountability Act of 1996.

Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards

HSMT B1.0: Students know how to use appropriate methods and technology in a multidisciplinary health care industry to communicate information.

HSMT B2.0: Students know the process for assessing and reporting the health status of patients and clients.

HSMT B3.0: Students know the principles of body mechanics as they apply to the positioning, transferring, and transporting of patients and clients.

HSMT B4.0: Students know how to explain procedures and goals to patients and clients and use various strategies to respond to questions and concerns.

HSMT B5.0: Students understand requests for procedures and know how to interpret the requests, plan the coordination and implementation of services, and prepare for specific procedures.

Sample analysis ("unpacking") of a standard for the Introduction to Imagery I course in the Diagnostic Services pathway:

Standard	**Health Sciences and Medical Technology B4.0:** Students know how to explain procedures and goals to patients and clients and use various strategies to respond to questions and concerns.	
Standard subcomponent	**Health Sciences and Medical Technology B4.1:** Know how to assess the ability of patients and clients to comprehend procedures and how to modify communication in accord with a patient's level of understanding.	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Importance of cultural and linguistic diversity and standards 2. Definition of *medical imagery* 3. Types and purposes of five basic imagery techniques 4. Required safety measures for each imagery technique	*Benchmarks* 1. Give a basic definition of *cultural and linguistic diversity and standards* and explain their implications for patient care. 2. Give and explain a basic definition of *medical imagery.* 3. Compare and contrast accurately the purpose of the various techniques. 4. Describe accurately the key safety measures for each technique.
What should students be able to do? At what level?	*Skills* 1. How to apply the culturally and linguistically appropriate standards (CLAS) to patient care 2. How to explain the type of diagnostic imagery technique a patient will experience, how it works, what its purpose is, and what hazards patients and staff may experience 3. How to correlate knowledge of organs, tissues, and cells with selected type of imagery 4. How to assess client's comprehension level 5. How to adjust data to be consistent with patient's or client's level of understanding	*Benchmarks* 1. Explain in example scenarios the methods and procedures to use to ensure that the culturally and linguistically appropriate standards are applied to a variety of patients. 2. Make factual and accurate explanations at the basic level. 3. Correlate accurately basic anatomy and physiology with selected type of imagery. 4. Name five ways to assess client's comprehension level and give examples. 5. Adjust basic explanation adequately to accommodate patient's or client's level of understanding.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–4 2. Medical terminology relevant to imagery 3. The culturally and linguistically appropriate standards and how to apply them 4. Methods of assessment of client understanding 5. Strategies for explaining complex material according to various levels of understanding	

Sample Performance Task

Standards: This sample performance task targets the following Health Science and Medical Technology industry sector foundation and Diagnostic Services pathway standards:

Standard number	Standards
Foundation: Academics 1.2 Focus on Life Sciences (grade seven) 5.b	Students know organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system.
Foundation: Technology 4.2	Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: HSMT B4.1	Know how to assess the ability of patients and clients to comprehend procedures and how to modify communication in accord with a patient's level of understanding.

Assignment: Explore the principles associated with medical imaging and learn patient education strategies corresponding with various imaging procedures. Working in pairs, you will:

1. Select a type of imaging technique from the following:
   a. Conventional Radiography
   b. Computer-Assisted Tomography (CT or CAT SCANS)
   c. Scanning Dynamic Spatial Reconstruction (DSR)
   d. Digital Subtraction Angiography (DSA)
   e. Positron Emission Tomography (PET)
   f. Magnetic Resonance Imaging (MRI)
   g. Sonography
2. Research the selected type of medical imaging and take thorough notes that include all of the following information:
   a. How it works
   b. Its purpose
   c. How it relates to organs, tissues, and cells and their functions
   d. The hazards it presents to patients and staff (Academics 1.2 Focus on Life Sciences [grade seven] 5.b; Technology 4.2).
3. Use the information gathered in your research to create a scenario or "role play" in which you demonstrate effective patient-staff interaction as you fully explain the imaging process, the reasoning behind the choice of process, its relation to body organs and tissues, and potential hazards. Demonstrate sensitivity to the patient's level of understanding and your ability to adjust your explanation to communicate successfully with the patient.

   Develop a brochure with illustrations or photos that captures the basic information and present it in a very comprehensible manner (HSMT B4.1; Academics 1.2 Focus on Life Sciences [grade seven] 5.b).
4. Present the scenario in role-play format to the class, giving class members a copy of the brochure (HSMT B4.1).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
HSMT B4.1: Know how to assess the ability of patients and clients to comprehend procedures and how to modify communication in accord with a patient's level of understanding. (45 points)	Role play demonstrates assessment of the patient's level of understanding, uses the culturally and linguistically appropriate explanation of selected technique, includes how imagery equipment works, what it is used for, and what hazards it poses for both patient and staff. Reasoning behind the selection of the technique is clear and logical. Brochure is clear and well illustrated. (45 points)	Role play demonstrates assessment of the patient's level of understanding, uses the culturally and linguistically appropriate explanation of selected technique, includes how imagery equipment works, what it is used for, and what hazards it poses for both patient and staff. Brochure is clear. (42 points)	Role play correctly and completely explains the procedures, but the explanation is not adjusted to the patient's level of understanding. Explanation of selected technique includes some discussion of how imagery equipment works, what it is used for, and what hazards it poses for patients and staff; but it may be incomplete or unclear. Brochure shows lack of effort. (37 points)	Role play features an incorrect or incomplete explanation of the procedures. (20 points)
Academics 1.2 Focus on Life Sciences (grade seven) 5.b: Students know organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system. (15 points)	Information presented correlates knowledge of body systems and their functions with the explained imagery technique. (15 points)	Information presented reflects appropriate knowledge of body systems and their functions and an understanding of the imaging technique. (12 points)	Information presented reflects minimal knowledge of body systems and does not address imaging techniques. (9 points)	Information presented reflects incorrect knowledge or no knowledge of body systems. (4 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Technology 4.2: Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services. (45 points)	Explanation of selected technique includes how imagery equipment works, what it is used for, and what hazards it poses for both patient and staff. Reasoning behind the selection of the technique is clear and logical. Brochure is clear and well illustrated. (45 points)	Explanation of selected technique includes how imagery equipment works, what it is used for, and what hazards it poses for patient and staff. Brochure is clear. (42 points)	Explanation of selected technique includes some discussion of how imagery equipment works, what it is used for, and what hazards it poses for patient and staff; but it may be incomplete or unclear. Brochure shows lack of effort. (37 points)	Explanation is inaccurate or does not cover how the equipment works, what it is used for, or what hazards it poses for patient and staff. (20 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of Pathway Occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Diagnostic Services Pathway Occupations	
High school (diploma)	• Medical Laboratory Aide • Transporter
Postsecondary training (certification and/or AA degree)	• Radiology Technologist* • Medical Laboratory Technician* • Cardiology Technologist* • Biotechnology Engineer • Medical Laboratory Assistant
College or university (bachelor's degree or higher)	• Biotechnology Scientist* • Radiologist* • Clinical Medical Technologist* • Geneticist*

Health Informatics

Sample sequence of courses in the Health Informatics pathway:

CTE courses	Related courses
Introductory • Introduction to Health Careers I • Introduction to Health Careers II • Hospital Occupations • Computer Technology	• Anatomy and Physiology • Biology • Algebra I • Algebra II • Food and Nutrition • Technical Computer Applications • Technical Writing and Communications
Concentration • Medical Terminology • Health: Biological Structure and Function	
Capstone • Skill-specific Health Informatics • Medical Coding • Medical Transcription • Insurance Billing	

Sample of appropriate foundation and pathway standards for the Medical Terminology course in the Health Informatics pathway:

Foundation standards

Communications 2.1 Reading Comprehension (grades nine and ten) 1.1: Identify and use the literal and figurative meanings of words and understand word derivations.

Communications 2.1 Reading Comprehension (grades nine and ten) 1.3: Identify Greek, Roman, and Norse mythology and use the knowledge to understand the origin and meaning of new words (e.g., the word *narcissistic* drawn from the myth of Narcissus and Echo).

Communications 2.1 Reading Comprehension (grades nine and ten) 2.1: Analyze the structure and format of functional workplace documents, including the graphics and headers, and explain how authors use the features to achieve their purposes.

Communications 2.1 Reading (grades eleven and twelve) 1.2: Apply knowledge of Greek, Latin, and Anglo-Saxon roots and affixes to draw inferences concerning the meaning of scientific and mathematical terminology.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.3: Write expository compositions, including analytical essays and research reports:

a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives.
b. Convey information and ideas from primary and secondary sources accurately and coherently.
c. Make distinctions between the relative value and significance of specific data, facts, and ideas.
d. Include visual aids by employing appropriate technology to organize and display information on charts, maps, and graphs.
e. Anticipate and address the listener's potential misunderstandings, biases, and expectations.
f. Use technical terms and notations accurately.

Foundation standards	**Communications 2.5:** Know and understand medical terminology to interpret, transcribe, and communicate information and observations necessary for workers in the health care industry.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**HSMT C1.1:** Know the process for managing the timely transfer of information accurately and effectively to the appropriate parties.
	HSMT C3.4: Formulate and report information clearly and concisely.
	HSMT C4.4: Know the process for determining the accuracy and completeness of data.
	HSMT C5.1: Know how to code information and develop summaries (abstracts) for use by other medical personnel by using appropriate medical terminology.

Sample analysis ("unpacking") of a standard for the Medical Terminology course in the Health Informatics pathway:

Standard	**Health Sciences and Medical Technology C5.0:** Students know how to read, interpret, and extract information from medical and other documents.	
Standard subcomponent	**Health Sciences and Medical Technology C5.1:** Know how to code information and develop summaries (abstracts) for use by other medical personnel by using appropriate medical terminology.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Definitions of all key terminology 2. Understanding of how medical transcription is done 3. Knowledge of the mechanics of encoding common language	*Benchmarks* 1. Define accurately basic meanings of key terminology given. 2. Describe accurately the process of medical transcription. 3. List all steps for encoding common language.
What should students be able to do? At what level?	*Skills* 1. Transcribe medical terminology into common language. 2. Encode common language into proper medical terminology. 3. Develop summaries or abstracts for use by other medical professionals.	*Benchmarks* 1. Transcribe medical terminology into common language accurately. 2. Encode common language into proper medical terminology accurately. 3. Develop an abstract of a sample patient's file, using correct terminology and abbreviations.
Topics and contexts **What must be taught?**	1. Common roots for medical terminology 2. Definitions of key terminology 3. Transcription and encoding procedures 4. Summary writing	

Sample Performance Task

Standards: This sample performance task targets the following Health Science and Medical Technology industry sector foundation and Health Informatics pathway standards:

Standard number	Standards
Foundation: Communications 2.1 Reading Comprehension (grades nine and ten) 1.1	Identify and use the literal and figurative meanings of words and understand word derivations.
Foundation: Communications 2.5	Know and understand medical terminology to interpret, transcribe, and communicate information and observations necessary for workers in the health care industry.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: HSMT C5.1	Know how to code information and develop summaries (abstracts) for use by other medical personnel by using appropriate medical terminology.

Assignment: Use your journals individually to complete the following activities. You will:

1. Read three articles from three different health care journals or Internet sites. List and define, in your own words, each of the medical terms you encounter. Summarize each article in abstract form for use by other medical professionals. Be sure to reference the journal article or Internet site (HSMT C5.1; Communications 2.1 Reading Comprehension [grades nine and ten] 1.1; Communications 2.5).
2. Select two paragraphs from those your teacher has given the class and transcribe those paragraphs, using appropriate medical terminology where applicable (HSMT C5.1; Demonstration and Application 11.0).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
HSMT C5.1: Know how to code information and develop summaries (abstracts) for use by other medical personnel by using appropriate medical terminology. (70 points)	Articles are selected from three different sources. All three abstracts are correctly prepared and clearly written. They accurately and succinctly communicate the necessary information in each article. They use appropriate medical terminology.	Articles are selected from three different sources. All three abstracts are correctly prepared and clearly written. They communicate the necessary information in each article. Only two or three errors are made in the selection or use of medical terminology.	Articles are selected from three different sources. One or more of the abstracts are too long or do not cover all the information in the article. There are more than three errors in the selection or use of medical terminology.	Articles are not selected from three different sources. Or abstracts are not written for all three articles. Or abstracts are too long or do not convey the necessary information. Or medical terminology is inappropriately, inadequately, or erroneously used.

Standards	Advanced	Proficient	Basic	Unacceptable
	Citations are present and correct. (70 points)	Citations are present and correct. (50 points)	Citations are present and correct. (30 points)	Or citations are incorrect, inadequate, or absent. (0 points)
Communications 2.5: Know and understand medical terminology to interpret, transcribe, and communicate information and observations necessary for workers in the health care industry. (20 points)	All medical words from the three selected articles are correctly and completely defined in the student's own words, with appropriate and thoughtful examples. The paragraphs are transcribed accurately and completely, and there are no transcription or terminology errors. (20 pointts)	All medical words from the three selected articles are correctly and completely defined in the student's own words. The paragraphs are transcribed accurately and completely, the transcription error rate is less than 10 percent, and there are fewer than three terminology errors. (12 points)	At least 90 percent of the medical words in the three selected articles are correctly and completely defined in the student's own words. The paragraphs are transcribed accurately, the transcription error rate is less than 10 percent, and there are fewer than six terminology errors. (6 points)	Less than 90 percent of the medical words in the three selected articles are defined. Or definitions are incorrect. Or at least one definition is not in the student's own words but is instead copied from another source, including that of another student. One or both paragraphs are not transcribed. Or transcription error rate is greater than 10 percent. Or there are more than five errors in terminology. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of Pathway Occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Health Informatics Pathway Occupations	
High school (diploma)	• Medical Records Clerk • Medical/Hospital Receptionist • Health Unit Coordinator • Medical Coder
Postsecondary training (certification and/or AA degree)	• Medical Transcriptionist* • Telehealth Technician • Medical Record Technician*
College or university (bachelor's degree or higher)	• Medical Librarian • Health Services Administrator • Hospital/Nursing Home Administrator • Health Educator

Support Services

Sample sequence of courses in the Support Services pathway:

CTE courses	Related courses
Introductory • Introduction to Health Careers I • Introduction to Health Careers II • Introduction to Hospital Occupations	• Anatomy and Physiology • Chemistry • Physical Science • Food and Nutrition • Microbiology • Algebra II • Computer Application
Concentration • Medical Terminology • Structure and Function	
Capstone • Medical Transporter • Hospital Support Services • Maintenance and Supply Technician	

Sample of appropriate foundation and pathway standards for the Introduction to Hospital Occupations course in the Support Services pathway:

Foundation standards

Academics 1.1 Measurement and Geometry (grade seven) 1.1: Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems.

Academics 1.1 Mathematical Reasoning (grade seven) 1.1: Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.

Academics 1.2 Focus on Life Sciences (grade seven) 5.c: Students know how bones and muscles work together to provide a structural framework for movement.

Academics 1.2 Biology/Life Sciences (grades nine through twelve) 10.a: Students know the role of the skin in providing nonspecific defenses against infection.

Academics 1.3 United States History and Geography (grade eleven) 11.8.1: Trace the growth of service sector, white collar, and professional sector jobs in business and government.

Academics 1.3 United States History and Geography (grade eleven) 11.11.3: Describe the changing roles of women in society as reflected in the entry of more women into the labor force and the changing family structure.

Communications 2.1 Reading (grades eleven and twelve) 1.2: Apply knowledge of Greek, Latin, and Anglo-Saxon roots and affixes to draw inferences concerning the meaning of scientific and mathematical terminology.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting):

a. Report information and convey ideas logically and correctly.
b. Offer detailed and accurate specifications.
c. Include scenarios, definitions, and examples to aid comprehension (e.g., troubleshooting guide).
d. Anticipate readers' problems, mistakes, and misunderstandings.

Foundation standards

Communications 2.2 Writing Strategies and Applications (grades eleven and twelve)
2.5: Write job applications and résumés:

a. Provide clear and purposeful information and address the intended audience appropriately.
b. Use varied levels, patterns, and types of language to achieve intended effects and aid comprehension.
c. Modify the tone to fit the purpose and audience.
d. Follow the conventional style for that type of document (e.g., résumé, memorandum) and use page formats, fonts, and spacing that contribute to the readability and impact of the document.

Communications 2.4 Listening and Speaking Applications (grades nine and ten)
2.1: Deliver narrative presentations:

a. Narrate a sequence of events and communicate their significance to the audience.
b. Locate scenes and incidents in specific places.
c. Describe with concrete sensory details the sights, sounds, and smells of a scene and the specific actions, movements, gestures, and feelings of characters.
d. Pace the presentation of actions to accommodate time or mood changes.

Communications 2.4 Listening and Speaking Applications (grades nine and ten)
2.2: Deliver expository presentations:

a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives.
b. Convey information and ideas from primary and secondary sources accurately and coherently.
c. Make distinctions between the relative value and significance of specific data, facts, and ideas.
d. Include visual aids by employing appropriate technology to organize and display information on charts, maps, and graphs.
e. Anticipate and address the listener's potential misunderstandings, biases, and expectations.
f. Use technical terms and notations accurately.

Career Planning and Management 3.1: Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers.

Technology 4.2: Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.

Problem Solving and Critical Thinking 5.3: Examine multiple options for completing work tasks by applying appropriate problem-solving strategies and critical thinking skills to work-related issues.

Ethics and Legal Responsibilities 8.5: Understand and maintain the Patients' Bill of Rights, patients' and clients' confidentiality, and the Health Insurance Portability and Accountability Act of 1996.

Pathway standards

HSMT D1.0: Students understand the responsibilities of their roles and perform their tasks safely by using appropriate guidelines.

HSMT D2.0: Students understand the protocols and practices necessary to maintain a clean and healthy work environment.

Pathway standards	**HSMT D3.0:** Students use principles and techniques of resource management to make appropriate decisions.
	HSMT D4.0: Students understand the development and implementation of legal regulations and facility standards for design, construction, maintenance, and improvement of health care facilities and environment.

Sample analysis ("unpacking") of a standard for the Introduction to Hospital Occupations course in the Support Services pathway:

Standard	**Health Sciences and Medical Technology D3.0:** Students use principles and techniques of resource management to make appropriate decisions.	
Standard subcomponent	**Health Sciences and Medical Technology D3.5:** Know the components of a comprehensive training program for health care, including safety, infection control, handling of hazardous materials, and use of equipment. (Note: the focus for the "unpacking" is on safety as it relates to hazardous biological disposal techniques.)	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Regulated biological waste and disposal techniques 2. Proper techniques for disposal of hazardous biological waste 3. Consequences of improper disposal of hazardous biological waste	*Benchmarks* 1. Describe five types of regulated biological waste and corresponding proper disposal techniques. 2. Contrast three proper and improper techniques for disposal of hazardous biological waste. 3. List and describe three consequences of improper disposal techniques.
What should students be able to do? At what level?	*Skills* 1. How to (a) research and define hazardous biological waste; (b) identify the proper and improper techniques for disposal of such waste; and (3) recognize the consequences of improper disposal 2. How to relate knowledge of proper and improper disposal of hazardous biological waste and relationship to human health and/or the environment	*Benchmarks* 1. Describe accurately proper and improper techniques for disposal of hazardous biological waste. 2. Describe accurately relationship of proper and improper disposal of hazardous biological waste and implications for human health and/or the environment.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–3 2. Greek, Latin, and Anglo-Saxon roots and affixes 3. Identification of hazardous waste and disposal techniques	

Sample Performance Task

Standards: This sample performance task targets the following Health Science and Medical Technology industry sector foundation and Support Services pathway standards:

Standard number	Standards
Foundation: Communications 2.4 Listening and Speaking Applications (grades nine and ten) 2.2	Deliver expository presentations: a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives. b. Convey information and ideas from primary and secondary sources accurately and coherently. c. Make distinctions between the relative value and significance of specific data, facts, and ideas. d. Include visual aids by employing appropriate technology to organize and display information on charts, maps, and graphs. e. Anticipate and address the listener's potential misunderstandings, biases, and expectations. f. Use technical terms and notations accurately.
Foundation: Technology 4.2	Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.
Pathway: HSMT D3.5	Know the components of a comprehensive training program for health care, including safety, infection control, handling of hazardous materials, and use of equipment.

Assignment: In this assignment students will explore and then adequately describe the possible consequences to human health and/or the environment of proper and improper disposal techniques of hazardous biological waste. In groups of three or four, you will:

1. Determine proper and improper techniques for disposal of hazardous biological waste by a review of the literature, by interviews with environmental specialists, and by observation in health care settings (HSMT D3.5).
2. Conduct research on the consequences of improper disposal of hazardous biological waste on human health and/or the environment (HSMT D3.5).
3. Develop a newsletter for hospital staff describing and illustrating proper and improper techniques for disposal of hazardous biological waste and the consequences of each (HSMT D3.5; Technology 4.2).
4. Present the newsletter information in a training session through a five-minute multimedia presentation to health care industry representatives, faculty, and families and make copies of the newsletter available as handouts (Communications 2.4 Listening and Speaking Applications [grades nine and ten] 2.2; Technology 4.2).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
HSMT D3.5: Know the components of a comprehensive training program for health care, including safety, infection control, handling of hazardous materials, and use of equipment. (50 points)	Presentation reflects thorough knowledge of proper and improper techniques for disposal of hazardous biological waste and consequences of the latter. Presentation contains creative examples to illustrate each point and includes secondary (for example, financial) as well as primary consequences. (50 points)	Presentation reflects factual knowledge of proper and improper techniques for disposal of hazardous biological waste and consequences of the latter. Presentation contains typical examples to illustrate each point. (40 points)	Presentation reflects basic knowledge of proper and improper techniques for disposal of hazardous biological waste and consequences of the latter. Presentation contains few or inappropriate examples. (32 points)	Presentation reflects limited or no knowledge of proper and improper techniques for disposal of hazardous biological waste or their consequences. Presentation contains few or inappropriate examples. (15 points)
Communications 2.4 Listening and Speaking Applications (grades nine and ten) 2.2: Deliver expository presentations. (30 points)	The newsletter accurately, informatively, and persuasively conveys all relevant information from both primary and secondary sources in an easy-to-understand manner. Extensive, original illustrations and other visual aids are used as examples and to support information described in text. The reader's potential questions, concerns, and confusion are anticipated and thoroughly addressed through a section on frequently asked questions. Technical terms appropriate to the audience are selected and used. (30 points)	The newsletter accurately and informatively conveys all relevant information from both primary and secondary sources in an easy-to-understand manner. Some original illustrations and other visual aids are used as examples to support information described in text. The reader's potential questions, concerns, and confusion are anticipated and addressed. Technical terms appropriate to the audience are selected and used. (27 points)	The newsletter conveys basic information drawn from primary and secondary sources. Illustrations are limited, are not useful, or are copied directly from a (cited) source. A few potential questions, concerns, or confusions are addressed. Terms may be inappropriate to the audience. (23 points)	The newsletter is confusing or inaccurate or is based on inadequate source material. Illustrations are absent or unrelated to the topic. The reader's potential concerns, questions, or confusions are not addressed. Technical terms are used inappropriately or are absent. (10 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Technology 4.2: Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services. (20 points)	During the presentation the student describes the use of at least four technological resources of at least two types to research, prepare, and present the newsletter. The resources are well chosen, and the information acquired is extensive and correct. (20 points)	During the presentation the student describes the use of at least three technological resources of at least two types to research, prepare, and present the newsletter. The resources are well chosen, and the information acquired is adequate and correct. (17 points)	During the presentation the student describes limited use of technological resources, including reliance on a single source or type of source (i.e., only Internet searches) to research, prepare, and present the newsletter. The information acquired is adequate and correct. (15 points)	During the presentation the student does not address the use of technological resources to research, prepare and present the newsletter. Or the resources are inappropriate. Or the information obtained is incorrect. (7 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of Pathway Occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Support Services Pathway Occupations	
High school (diploma)	• Central Supply Aide • Environmental Services Assistant
Postsecondary training (certification and/or AA degree)	• Central Supply Technician* • Environmental Services Technician* • Mortician*
College or university (bachelor's degree or higher)	• Materials Management Supervisor* • Environmental Health Specialist* • Industrial Hygienist* • Nursing Home Administrator* • Health Educator*

Therapeutic Services

Sample sequence of courses in the Therapeutic Services pathway:

CTE courses	Related courses
Introductory • Introduction to Health Careers I • Introduction to Health Careers II • Introduction to Hospital Occupations	• Chemistry • Biology • Physics • Mathematics Analysis or Calculus • Computer Applications • Technical Communications • Anatomy and Physiology • Food and Nutrition
Concentration • Medical Terminology • Structure and Function • Hospital Occupations II	
Capstone • Certified Nursing Assistant • Medical Assistant • Dental Assistant • Emergency Medical Technician	

Sample of appropriate foundation and pathway standards for the Certified Nursing Assistant course in the Therapeutic Services pathway:

Foundation standards	**Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6:** Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting): a. Report information and convey ideas logically and correctly. b. Offer detailed and accurate specifications. c. Include scenarios, definitions, and examples to aid comprehension (e.g., trouble-shooting guide). d. Anticipate readers' problems, mistakes, and misunderstandings.
	Communications 2.5: Know and understand medical terminology to interpret, transcribe, and communicate information and observations necessary for workers in the health care industry.
	Communications 2.7: Understand the importance of verbal and nonverbal communication in the health care industry.
	Technology 4.5: Know how to interpret technical materials and medical instrumentation used for health care practices and policies.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**HSMT E1.0:** Students know how to communicate procedures and goals to patients and clients and members of the health care team by using a variety of strategies.
	HSMT E1.1: Know how to evaluate the ability of patients and clients to understand the information provided.
	HSMT E1.2: Use appropriate communication strategies with patients and clients.
	HSMT E5.0: Students know how to evaluate patients' and clients' needs, abilities, and challenges to determine whether treatment goals are being reached.

Sample analysis ("unpacking") of a standard for the Certified Nursing Assistant course in the Therapeutic Services pathway:

Standard	**Health Sciences and Medical Technology E5.0:** Students know how to evaluate patients' and clients' needs, abilities, and challenges to determine whether treatment goals are being reached.	
Standard subcomponent	**Health Sciences and Medical Technology E5.1:** Use the appropriate evaluation tools to assess patients and clients (Note: focus in "unpacking" is on blood pressure assessment.)	
Course level	❑ Introductory ❑ Concentration ☒ Capstone	
What do students need to know? At what level?	*Concepts* 1. How the circulatory system is evaluated, including pulse points and normal diastolic and systolic limits 2. Relationships of the diameter of arm and cuff 3. Significance of measuring blood pressure 4. Types of equipment used for assessment of blood pressure	*Benchmarks* 1. Identify appropriate pulse points and normal range of blood pressure. 2. Define rule for selection of cuff size. 3. Describe the principle of arterial pressure. Identify appropriate scale used to measure blood pressure. 4. Cite three types of equipment used for assessment of blood pressure.
What should students be able to do? At what level?	*Skills* 1. How to measure blood pressure 2. How to record and document blood pressure	*Benchmarks* 1. Place stethoscope properly over brachial artery; place cuff 1 inch above stethoscope; inflate cuff to 170 mm; slowly deflate cuff (2–3 mm/sec) while listening for first audible beat; accurately note number of that beat; continue slow deflation until last beat disappears; accurately note number of last beat. 2. Record blood pressure accurately on chart and graph and report blood pressure outside normal limits.
Topics and contexts **What must be taught?**	1. Basic knowledge of the preceding concepts 1–4 2. Accurate measurement of blood pressure 3. Accurate recording of blood pressure	

Sample Performance Task

Standards: This sample performance task targets the following Health Science and Medical Technology industry sector foundation and Therapeutic Services pathway standards:

Standard number	Standards
Foundation: Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6	Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting): a. Report information and convey ideas logically and correctly. b. Offer detailed and accurate specifications. c. Include scenarios, definitions, and examples to aid comprehension (e.g., troubleshooting guide). d. Anticipate readers' problems, mistakes, and misunderstandings.

Standard number	Standards
Foundation: Technology 4.5	Know how to interpret technical materials and medical instrumentation used for health care practices and policies.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: HSMT E5.1	Use the appropriate evaluation tools to assess patients and clients.

Assignment: Work in pairs to practice measurement and recording of blood pressure. You and your partner will take turns being patient and provider. The provider will:

1. Select proper instruments and equipment for assessing and recording blood pressure (HSMT E5.1; Technology 4.5).
2. Identify appropriate pulse points on the patient for taking blood pressure: radial, brachial, and popliteal pulses (Technology 4.5).
3. Identify range of normal blood pressure for children and adults (Technology 4.5).
4. Choose the correct cuff size for the patient (HSMT E5.1; Technology 4.5).
5. Identify appropriate scale to measure blood pressure (Technology 4.5).
6. Place stethoscope properly over brachial artery and inflate cuff to 170 mm (HSMT E5.1).
7. Deflate cuff slowly (2–3 mm/sec) while listening for first audible beat. Note that number. Continue slow deflation until last beat disappears. Note that number (HSMT E5.1; Technology 4.5).
8. Record blood pressure on chart and graph in patient's record and report anything outside normal limits (HSMT E5.1; Technology 4.5).

Once you and your partner have taken a turn as provider, work together to write and illustrate a brief (two- to four-page) manual on the appropriate way to take blood pressure (HSMT E5.1; Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.6).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
HSMT E5.1: Use the appropriate evaluation tools to assess patients and clients. (50 points)	Cuff is properly placed. Stethoscope is correctly centered over artery and is close to cuff. Cuff is inflated to the proper pressure, between 160 and 170.	Cuff is properly placed or placed too high. Stethoscope is correctly centered over artery. Cuff is over-inflated.	Cuff is improperly positioned on the elbow joint. Stethoscope is not centered over artery and is close to cuff. Cuff is under-inflated.	Cuff is inverted when placed on patient. The stethoscope is below the antecubital space.

Standards	Advanced	Proficient	Basic	Unacceptable
	Pressure release is steady and controlled and ensures that patient has minimum necessary period of pressure discomfort. (50 points)	Pressure release is too slow, so that patient experiences more than the minimum necessary period of pressure discomfort. (40 points)	Pressure release is unsteady or too fast. Patient has more than the minimum necessary period of pressure discomfort. (30 points)	Cuff is not correctly inflated or deflated. Student does not know how to work valve. (20 points)
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting). (20 points)	All facts are completely and accurately conveyed. The manual is easy to follow and contains all information necessary for taking blood pressure, including accurate specifications. Original illustrations and visual aides are used to enhance comprehension. Common problems with taking or interpreting blood pressure are discussed, and solutions are provided. (20 points)	All facts are completely and accurately conveyed. The manual is logical and contains all information necessary for taking blood pressure, including accurate specifications. At least one illustration is used to enhance comprehension. It may be copied from a cited source. (14 points)	Most facts are completely and accurately conveyed. The manual is illogically constructed or is difficult to follow. Some necessary information is lacking. (7 points)	Some facts are inaccurate. The manual is difficult or impossible to follow. Significant information is lacking. Illustrations are not present or are copied from an uncited source. (0 points)
Technology 4.5: Know how to interpret technical materials and medical instrumentation used for health care practices and policies. (30 points)	Appropriate instrument is selected to measure blood pressure, and appropriate cuff is selected for patient. All pulse points are correctly identified at first try. Appropriate scale is selected to measure blood pressure.	Appropriate instrument is selected to measure blood pressure, and appropriate cuff is selected for patient. All pulse points are correctly identified, with some assistance from instructor or other students. Appropriate scale is selected to measure blood pressure.	Appropriate instrument is selected to measure blood pressure, and appropriate cuff is selected for patient. Pulse points are identified only with extensive help from instructor or other students. Student requires help to select appropriate scale to measure blood pressure.	Inappropriate cuff is selected for patient. Or student cannot locate pulse points. Or student does not select appropriate scale to measure blood pressure. Or student does not record systolic and diastolic pressure or records them in an inappropriate location or does not chart them.

Standards	Advanced	Proficient	Basic	Unacceptable
	Student accurately records and charts both systolic and diastolic pressure on patient chart. Student clearly explains the significance and meaning of both measurements. (30 points)	Student records and charts systolic and diastolic pressure within 2mm of accuracy. Student explains the significance of both measurements. (25 points)	Student records and charts systolic and diastolic pressure within 4mm of accuracy. Student can explain the significance of only the systolic measurement. (15 points)	Or systolic or diastolic measurement has a margin of error greater than 4mm. Or student cannot explain the significance of the measurements. (5 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of Pathway Occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Therapeutic Services Pathway Occupations	
High school (diploma)	• Physical Therapy Aide • Certified Nurses Assistant* • Respiratory Therapy Aide • Medical Assistant • Emergency Medical Technician*
Postsecondary training (certification and/or AA degree)	• Fitness/Aerobics Instructor* • Registered Physical Therapy Aide* • Licensed Vocational Nurse/ Registered Nurse* • Pharmacy Technician* • Dental Hygienist*
College or university (bachelor's degree or higher)	• Exercise Physiologist* • Physical Therapist* • Physician Assistant* • Dentist* • Pharmacist*

Note

1. Bureau of Labor Statistics, *Career Guide to Industries.* Washington, D.C.: U.S. Department of Labor, 2006. http://www.bls.gov/oco/cg/

Hospitality, Tourism, and Recreation Industry Sector

The Hospitality, Tourism, and Recreation industry sector includes California's fastest-growing industries: travel, recreation, and food and hospitality. Nearly 900,000 jobs are directly supported by the travel industry, making tourism the state's third largest employer; and the industry is expected to expand by more than 2 percent per year through 2014.[1] Food service occupations, ranging from food production and service to the study of human nutrition and wellness, bring in over $970 million a day and account for 8 percent of jobs worldwide.[2] The California restaurant industry is the largest employer in the state, providing 957,000 jobs, with annual projected sales of $51.5 billion and sales tax revenues of $4 billion.[3] Students choosing a career in this industry sector are eligible for positions throughout the world, with potential for advancement and ready availability of continuing employment. To support this burgeoning sector, colleges and universities throughout California and the United States offer courses and degree programs in this field.

This sector encompasses three distinct yet related career pathways: Food Science, Dietetics, and Nutrition; Food Service and Hospitality; and Hospitality, Tourism, and Recreation. Each pathway includes a coherent sequence of courses, starting with a foundation course that leads to one or more concentration courses and a capstone course. The concentration courses focus on technical preparation, including career awareness and exploration, which is based on industry-approved curricula. The necessary knowledge and skills are acquired within a sequential, standards-based program that encompasses hands-on, project-based, and work-based instruction as well as leadership development, internship, mentoring, work experience, job shadowing, and cooperative career technical education.

Hospitality, Tourism, and Recreation Industry Sector Pathways:

- Food Science, Dietetics, and Nutrition
- Food Service and Hospitality
- Hospitality, Tourism, and Recreation

Food Science, Dietetics, and Nutrition

Sample sequence of courses in the Food Science, Dietetics, and Nutrition pathway:

CTE courses	Related courses
Introductory • Home Economics Careers and Technology Comprehensive Core I • Home Economics Careers and Technology Comprehensive Core II	• Chemistry • Individual and Family Health • Biology • Anatomy • Computer Applications
Concentration • Food for Health and Fitness • Food Technology and Nutrition • Food Science (Chemistry of Foods)	
Capstone • Careers in Food Science, Dietetics, and Nutrition • Food Science and Dietetics	

Sample of appropriate foundation and pathway standards for the Careers in Food Science, Dietetics, and Nutrition course in the Food Science, Dietetics, and Nutrition pathway:

Foundation standards

Academics 1.1 Algebra I (grades eight through twelve) 13.0: Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.3: Write expository compositions, including analytical essays and research reports:

a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives.
b. Convey information and ideas from primary and secondary sources accurately and coherently.
c. Make distinctions between the relative value and significance of specific data, facts, and ideas.
d. Include visual aids by employing appropriate technology to organize and record information on charts, maps, and graphs.
e. Anticipate and address readers' potential misunderstandings, biases, and expectations.
f. Use technical terms and notations accurately.

Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6: Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).

Technology 4.2: Understand the use of technological resources to access, manipulate, and produce information, products, and services.

Problem Solving and Critical Thinking 5.3: Use critical thinking skills to make informed decisions and solve problems.

Technical Knowledge and Skills 10.1: Understand the principles of nutrition and their relationship to good health through the life cycle.

Foundation standards	**Technical Knowledge and Skills 10.5:** Understand the aspects of science related to food preparation, product development, and nutrition.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway standards	**HTR A4.0:** Students understand the relationship of basic nutritional principles and concepts to the physical and emotional well-being of individuals.
	HTR A5.0: Students understand the correlation of food and fitness to wellness.
	HTR A8.0: Students understand the basic principles of chemistry and physics related to changes in foods and food products during preparation, processing, and preservation.
	HTR A10.0: Students understand the fundamental concepts of marketing and public relations used in the dissemination of information about food science, dietetics, and nutrition.

Sample analysis ("unpacking") of a standard for the Careers in Food Science, Dietetics and Nutrition course in the Food Science, Dietetics, and Nutrition pathway:

Standard	**Hospitality, Tourism, and Recreation A4.0:** Students understand the relationship of basic nutritional principles and concepts to the physical and emotional well-being of individuals.	
Standard subcomponent	**Hospitality, Tourism, and Recreation A4.2:** Analyze appropriate nutrient intake, diet, and energy expenditure for individuals of different ages and with different dietary and health needs.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. The concept of healthy weight 2. The concepts of metabolism and energy balance 3. Influence of metabolic rate on various factors 4. Dietary guidelines 5. Essential nutrients 6. Finding nutrient content of foods	*Benchmarks* 1. List at least four variables that define a healthy weight. 2. Define *metabolism* and *energy balance* and give at least two accurate examples. 3. Cite five examples of ways in which metabolic rate influences various bodily functions. 4. Cite six dietary guidelines and summarize the reasoning behind each. 5. List six essential nutrients and explain why each is essential. 6. Know four methods of finding nutrient content: food labels, software, exchange lists, and pyramid.
What should students be able to do? At what level?	*Skills* 1. How to determine caloric needs 2. How to analyze caloric and nutrient content of foods 3. How to improve an individual's food and exercise plan	*Benchmarks* 1. Calculate basal metabolic rate and caloric expenditure for five types of activity and exercise with at least 95 percent accuracy. 2. Utilize all four methods of nutrient analysis to determine the caloric and nutrient content of foodstuffs with at least 90 percent accuracy. 3. Plan appropriate dietary patterns and levels of exercise for a sample individual to maintain or achieve a healthy weight.

Topics and contexts **What must be taught?**	1. Knowledge of preceding concepts 1–6 2. Accurate and specific recording of food intake 3. Calculating basal metabolic rate (BMR) and energy expenditure 4. Using nutritional analysis software, food labels, exchange lists, and pyramid to determine caloric values 5. Interpreting results of calorie and nutrient analysis according to different health needs

Sample Performance Task

Standards: This sample performance task targets the following Hospitality, Tourism, and Recreation industry sector foundation and Food Science, Dietetics, and Nutrition pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Algebra I (grades eight through twelve) 13.0	Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.
Foundation: Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.3	Write expository compositions, including analytical essays and research reports: a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives. b. Convey information and ideas from primary and secondary sources accurately and coherently. c. Make distinctions between the relative value and significance of specific data, facts, and ideas. d. Include visual aids by employing appropriate technology to organize and record information on charts, maps, and graphs. e. Anticipate and address readers' potential misunderstandings, biases, and expectations. f. Use technical terms and notations accurately.
Foundation: Technology 4.2	Understand the use of technological resources to access, manipulate, and produce information, products, and services.
Foundation: Problem Solving and Critical Thinking 5.3	Use critical thinking skills to make informed decisions and solve problems.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway: HTR A4.2	Analyze appropriate nutrient intake, diet and energy expenditure for individuals of different ages and with different dietary and health needs.

Assignment: Obesity is becoming a dangerous epidemic among young people. Your future health and the prevention of obesity-related diseases depend on your having an appropriate dietary intake for your level of activity. Record the foods you eat and the activities you participate in for three days. Use a detailed time chart and record (1) the exact amounts, names, and brands of food you eat during a 72-hour period; and (2) the length and intensity of your physical activities. In this assignment you are to:

1. Analyze your food intake, using the food analysis software provided in the classroom (HTR A4.2; Technology 4.2).
2. Use the information in your text to calculate your metabolic rate and caloric expenditure for the level of activities in which you participate (HTR A4.2; Academics 1.1 Algebra I [grades eight through twelve] 13.0).
3. Compare your intake to your activity level (HTR A4.2; Academics 1.1 Algebra I [grades eight through twelve] 13.0).
4. Determine the average three-day difference between your caloric food intake and your caloric expenditure (HTR A4.2; Academics 1.1 Algebra I [grades eight through twelve] 13.0).
5. Calculate your yearly weight gain or loss according to the difference (HTR A4.2; Academics 1.1 Algebra I [grades eight through twelve] 13.0).
6. Present your findings in graphical form in monthly increments (HTR A4.2; Academics 1.1 Algebra I [grades eight through twelve] 13.0).
7. Prepare a written report of at least 500 words to explain your findings and recommend changes in eating habits and exercise that will result in appropriate, healthy weight loss or gain as needed (HTR A4.2; Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.3; Problem Solving and Critical Thinking 5.3).

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
HTR A4.2: Analyze appropriate nutrient intake, diet, and energy expenditure for individuals of different ages and with different dietary and health needs.	Food intake is correctly recorded and analyzed. All factors have been taken into consideration, all research is thorough, and all calculations are correct. The reasoning behind the findings and recommendations is logical and is based on the research.	Food intake is correctly recorded and analyzed. All factors have been taken into consideration, and the calculations are correct; but the research is not thorough. The findings and/or recommendations are not fully based on the research.	Food intake is correctly recorded but is not correctly analyzed. Not all factors have been taken into consideration. The calculations have errors. The research is incomplete, and/or the findings and recommendations are inaccurate.	Food intake is incorrectly recorded and analyzed. The report lacks the required elements.

Standards	Advanced	Proficient	Basic	Unacceptable
Academics 1.1 Algebra I (grades eight through twelve) 13.0: Students add, subtract, multiply, and divide rational expressions and functions. Students solve challenging problems by using these techniques.	Calculations of energy expenditure based on reported weight are 100 percent correct. Graphic report correctly extrapolates yearly weight change.	Calculations of energy expenditure based on reported weight are 90 percent correct. Graphic report extrapolates yearly weight change.	Calculations of energy expenditure based on reported weight are 80 percent correct. Graphic report contains some errors above and beyond the original error in calculations.	Calculations of energy expenditure are not correct, and/or graphic report is missing or incomplete.
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.3: Write expository compositions, including analytical essays and research reports.	The report is clear, well written, detailed, and accurate. It includes all the information from the entire food analysis process and uses appropriate language, including technical terminology. The report is more than 600 words long and contains no grammatical, typographical, or other errors.	The report is clear, detailed, and accurate. It includes all the information from the entire food analysis process and uses appropriate language, including technical terminology. The report is 500 to 599 words long and contains fewer than three grammatical, typographical, or other errors.	The report is clear and accurate. It includes most of the information from the food analysis process and uses appropriate language. The report is 400 to 499 words long and contains fewer than six grammatical, typographical, or other errors.	The report is unclear or inaccurate. Or significant information is lacking. Or it uses inappropriate language. Or it is shorter than 400 words. Or it contains six or more grammatical, typographical, or other errors.
Technology 4.2: Understand the use of technological resources to access, manipulate, and produce information, products, and services.	Computer software is accurately and completely used. Advanced functions of the software were used to increase the accuracy and usefulness of the analysis.	Computer software is accurately and completely used. Basic functions of the software were used for recording and summarizing the data only.	Computer software is used inaccurately. Basic functions (recording and summarizing data) of the software were not used.	Student was not able to use the computer software.
Problem Solving and Critical Thinking 5.3: Use critical thinking skills to make informed decisions and solve problems.	Recommendations for changes are practical and realistic and include both diet and exercise.	Recommendations for changes include diet and exercise but are not practical for the individual.	Recommendations for changes do not include aspects of both intake and exercise.	Recommendations for changes are not included in the report.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Food Science, Dietetics, and Nutrition Pathway Occupations	
High school (diploma)	• Dietary Aide • Food Product Tester • Test Food Kitchen Assembler • Food Laboratory Aide • Quality Control Technician
Postsecondary training (certification and/or AA degree)	• Dietetic Technician* • Food Production Chemist • Personal Chef • Food Inspector* • Test Kitchen Chef
College or university (bachelor's degree or higher)	• Registered Dietitian* • Food Technologist • Food Scientist • Food Product Developer • Food Journalist/Technical Writer

Food Service and Hospitality

Sample sequence of courses in the Food Service and Hospitality pathway:

CTE courses	Related courses
Introductory • Home Economics Careers and Technology Comprehensive Core I • Home Economics Careers and Technology Comprehensive Core II	• Entrepreneurship • Business • Accounting
Concentration • Nutritional Science • Foods and Nutrition • Food, Nutrition, and Meal Management	
Capstone • Careers in Food Service and Hospitality (Culinary Arts) • Food and Beverage Production	

Sample of appropriate foundation and pathway standards for the Careers in Food Service and Hospitality (Culinary Arts) course in the Food Service and Hospitality pathway:

Foundation standards	**Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6:** Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).

Foundation standards	**Problem Solving and Critical Thinking 5.1:** Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
	Health and Safety 6.1: Know the policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities.
	Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
	Technical Knowledge and Skills 10.2: Understand the basic principles of food safety and sanitation and the proper techniques for preparing and serving food.
	Technical Knowledge and Skills 10.7: Understand how to select, safely use, and efficiently care for facilities and equipment related to food product development, food preparation, dining, lodging, tourism, and recreation.
Pathway standards	**HTR B3.3:** Understand safe and sanitary procedures in all food handling, including food receiving, storage, production, service, and cleanup.
	HTR B3.4: Know the types of food contamination, the potential causes, including cross-contamination, and methods of prevention.
	HTR B3.5: Know the essential principles of Hazard Analysis Critical Control Points, including the use of flowcharts.
	HTR B3.6: Understand the purpose of and process for required certification (e.g., ServSafe).
	HTR B6.1: Know the qualities and properties of food items and ingredients used in food preparation.

Sample analysis ("unpacking") of a standard for the Careers in Food Service and Hospitality (Culinary Arts) course in the Food Service and Hospitality pathway:

Standard	**Hospitality, Tourism, and Recreation B3.0:** Students understand the basic principles of sanitation and safe food handling.	
Standard subcomponent	**Hospitality, Tourism, and Recreation B3.4:** Know the types of food contamination, the potential causes, including cross-contamination, and methods of prevention.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Conditions that promote growth of microorganisms 2. Microorganisms responsible for food-borne illnesses 3. Food sources of each of the microorganisms in item 2 4. Symptoms of and susceptibility to food-borne illness for each microorganism identified 5. Cross-contamination and its causes	*Benchmarks* 1. Identify basic conditions for growth of microorganisms. 2. List the four microorganisms responsible for 80 percent of all food-borne illnesses. 3. Identify two food sources for each of the microorganisms in item 2. 4. Describe the symptoms for each microbial food-borne illness and name categories of people most susceptible. 5. Give the basic definition of *cross-contamination* and list three causes.

	Skills	*Benchmarks*
What should students be able to do? At what level?	1. How to apply knowledge of causes and sources of food-borne illness to the safe labeling and storage of food 2. How to avoid cross-contamination 3. How to transport potentially hazardous foods safely 4. Adherence to all relevant laws and regulations regarding food preparation	1. Label and store all food according to ServSafe standards. 2. Demonstrate key food-preparation steps to prevent cross-contamination. 3. Prepare four potentially hazardous foods for safe transportation. 4. Practice ServSafe and HACCP food preparation guidelines.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–5 2. ServSafe/HACCP guidelines 3. How to apply knowledge of causes and sources of food-borne illness to the safe preparation, storage, service, and transportation of potentially hazardous foods	

Sample Performance Task

Standards: This sample performance task targets the following Hospitality, Tourism, and Recreation industry sector foundation standards and Food Service and Hospitality pathway standards:

Standard number	Standards
Foundation: Health and Safety 6.1	Know the policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
Pathway: HTR B3.3:	Understand safe and sanitary procedures in all food handling, including food receiving, storage, production, service, and cleanup.
Pathway: HTR B3.4:	Know the types of food contamination, the potential causes, including cross-contamination, and methods of prevention.
Pathway: HTR B3.5:	Know the essential principles of Hazard Analysis Critical Control Points, including the use of flowcharts.
Pathway: HTR B6.1:	Know the qualities and properties of food items and ingredients used in food preparation.

Assignment: In your cooperative learning group, analyze the following menu served at a picnic to determine what caused five people to contract food poisoning (Leadership and Teamwork 9.3). In this assignment you are to:

1. List at least five foods or food-handling procedures that might have caused the production of microorganisms that resulted in the outbreak of the food-borne illness (HTR B3.3; HTR B3.4).
2. List the ingredients for each food served that could have harbored the microorganisms (HTR B3.4; HTR B6.1).
3. List the HACCP steps in food preparation that should have been followed to prevent the outbreak (HTR B3.3; HTR B3.5; Health and Safety 6.1).

Picnic Scenario

You are attending a Pacific Symphony Under the Stars Concert at which a local company is catering the lunch (see the following menu). On the next day five members of your party suffer cramps, nausea, headaches, diarrhea, and vomiting. Consult the preceding assignment to determine what microorganisms, ingredients, methods of preparation, handling, transportation, or storage may have caused the food-borne illness and what HACCP steps should have been followed to prevent it.

Picnic Menu

Green Salad with Italian Dressing
Sourdough Rolls with Butter
Deviled Eggs
BBQ Chicken
Potato Salad
Fresh-cut Watermelon
Chocolate Chip Cookies and Chocolate Brownies

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
HTR B3.3: Understand safe and sanitary procedures in all food handling, including receiving, storage, production, service, and cleanup.	Reponses show a comprehensive knowledge of safe food-handling processes, including a list of procedures (receiving, storage, production, service, and cleanup) specifically applicable to each food ingredient and item in the picnic menu.	Reponses show knowledge of safe food-handling processes, including a list of procedures (receiving, storage, production, service, and cleanup) specifically applicable to the food ingredients and items in the picnic menu that were most likely to cause the illness outbreak.	Reponses show knowledge of safe food-handling processes. The list of procedures includes four of the required elements (receiving, storage, production, service, and cleanup) specifically applicable to the food ingredients and items in the picnic menu that were most likely to cause the illness outbreak.	Responses do not show adequate knowledge of safe food-handling processes. The list of procedures includes fewer than four of the required elements (receiving, storage, production, service, and cleanup). Or the list is not specifically applied to the food items in the picnic menu. Or the list of procedures is incorrect.
HTR B3.4: Know types of food contamination, the potential causes, including cross-contamination, and methods of prevention.	The responses list at least four potential causes of food contamination, including cross-contamination, and four methods of prevention.	The responses list at least three potential causes of food contamination, including cross-contamination, and three methods of prevention.	The responses list at least three potential causes of food contamination, including cross-contamination, and two methods of prevention.	The responses do not list at least three potential causes of food contamination. Or they list fewer than two methods of prevention. Or the answers are incorrect or vague.

Standards	Advanced	Proficient	Basic	Unacceptable
HTR B3.5: Know the essential principles of Hazard Analysis Critical Control Points, including the use of flowcharts.	The answers correctly list all HACCP principles and include a thorough discussion of how each principle should have been applied to prevent an outbreak of food-borne illness in this scenario. An accurate flowchart is included.	The answers correctly list all principles of the HACCP and include a thorough discussion of how each principle should have been applied to prevent an outbreak of food-borne illness in this scenario.	The answers correctly list all principles of the HACCP, with some general information about how the HACCP should have been applied to prevent an outbreak of food-borne illness in this scenario.	The answers do not correctly list all the principles of the HACCP. Or they do not make any references to how the HACCP should have been applied to prevent an outbreak of food-borne illness in this scenario.
HTR B6.1: Know the qualities and properties of food items and ingredients used in food preparation.	The responses include a list of probable and possible ingredients in each element of the picnic menu, with a discussion of each food item's qualities and properties.	The responses include a list of probable ingredients in each element of the picnic menu, with a discussion of each food item's qualities and properties.	The responses include a list of probable ingredients in each element of the picnic menu, with a discussion of the qualities and properties of at least half the food items.	The responses do not include a list of ingredients for each element of the picnic menu. Or the responses discuss the qualities and properties of less than half of the ingredient list. Or information provided is incorrect.
Health and Safety 6.1: Know the policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities.	The answers include specific, detailed information about potential mistakes in the handling of each food item. Includes correct, complete citations from the health code for each answer.	The answers include specific, detailed information about potential mistakes in the handling of each food item. Includes partial citations of and/or extensive references to the health code.	The answers include general information about potential mistakes in the handling of each food item. Includes references to the health code.	The answers do not include information about mistakes in the handling of each food item. Or they do not make references to the health code. Or any of these elements is present but incorrect.
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.	Teacher observes student taking an active leadership role in developing responses for the scenario and working effectively with other group members.	Teacher observes student actively helping to develop responses to the scenario and working effectively with other group members.	Teacher observes student adequately participating in developing scenario responses and working fairly well with other group members.	Teacher observes little or no involvement by the student in assisting the group to develop scenario responses and not working well with other group members.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Food Service and Hospitality Pathway Occupations	
High school (diploma)	• Line cook • Baker Helper • Wait Staff • Pastry Chef Assistant • Food Expediter
Postsecondary training (certification and/or AA degree)	• Caterer • Pastry Chef* • Chef* • Food Service Manager* • Food Designer
College or university (bachelor's degree or higher)	• Sous/Executive Chef • Food and Beverage Analyst • General Manager • Food Service Director • Food Stylist

Hospitality, Tourism, and Recreation

Sample sequence of courses in the Hospitality, Tourism, and Recreation pathway:

CTE courses	Related courses
Introductory • Home Economics Careers and Technology Comprehensive Core I • Home Economics Careers and Technology Comprehensive Core II	• Entrepreneurship • Business • Accounting • Computer Applications • Geography • Interior Design, Furnishings, and Maintenance
Concentration • Introduction to Hospitality and Tourism • Introduction to the Lodging Industry • Principles of Event Planning • Introduction to Travel and Tourism	
Capstone • Careers in Hospitality, Tourism, and Recreation • Lodging and Hotel Operations • Attractions, Events, and Related Services • Travel-related Services	

Sample of appropriate foundation and pathway standards for the Introduction to Hospitality and Tourism course in the Hospitality, Tourism, and Recreation pathway:

Foundation standards	**Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6:** Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).
	Problem Solving and Critical Thinking 5.1: Apply appropriate problem solving strategies and critical thinking skills to work related issues and tasks.
	Health and Safety 6.1: Know the policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities.
	Ethics and Legal Responsibilities 8.3: Understand the role of personal integrity and ethical behavior in the workplace.
	Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
	Leadership and Teamwork 9.5: Understand how to interact with others in ways that demonstrate respect for individual and cultural differences and for the attitudes and feeling of others.
	Technical Knowledge and Skills 10.7: Understand how to select, safely use, and efficiently care for facilities and equipment related to food product development, food preparation, dining, lodging, tourism, and recreation.
Pathway standards	**HTR C2.2:** Understand how the mission and goals of a business affect operations in the hospitality, tourism and recreation industry.
	HTR C2.3: Know common safety, security, and emergency policy and procedures used in the hospitality industry to protect guests, visitors, and employees (e.g., safe work practices and conditions, confidentiality of customer information, control of keys, infectious disease control, first-aid procedures, emergency training).
	HTR C2.5: Understand the importance of specific human resource practices and procedures that address workplace diversity, harassment, personal safety, and discrimination.
	HTR C3.1: Understand the importance of guest services to the success of the industry.
	HTR C3.2: Understand the concept of exceptional guest service.
	HTR C3.3: Anticipate the needs, desires, and interests of guests in order to exceed their expectations.
	HTR C3.5: Understand the roles of management and employees in effectively meeting the needs of culturally and generationally diverse groups.
	HTR C3.6: Interact with guests in a positive, responsive, and professional manner.

Sample analysis ("unpacking") of a standard for the Introduction to Hospitality and Tourism course in the Hospitality, Tourism, and Recreation pathway:

Standard	**Hospitality, Tourism, and Recreation C3.0:** Students understand and apply the knowledge and skills essential for effective guest services in the hospitality, tourism, and recreation industry sector.	
Standard subcomponent	**Hospitality, Tourism, and Recreation C3.1:** Understand the importance of guest services to the success of the industry.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Components of guest service 2. Types of lodging facilities and their amenities 3. Reasons for delivering exceptional guest service 4. Mission statement and how it reflects the image of a facility	*Benchmarks* 1. Define and give examples of the components of *guest service.* 2. Cite four types of lodging facilities and give four examples of amenities for each category. 3. Cite three reasons for delivering excellent guest service. 4. Define and explain the basic relationship between a mission statement and a facility's image.
What should students be able to do? At what level?	*Skills* 1. How to write a mission statement 2. How to develop an employee fact sheet on exceptional service practice 3. How to evaluate performances demonstrating exceptional service	*Benchmarks* 1. Write a basic mission statement reflecting an emphasis on excellent guest service for a hypothetical lodging establishment. 2. Develop a basic fact sheet, including at least eight rules and examples of exceptional guest service. 3. Demonstrate at least five elements of exceptional guest service.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–4 2. Components of a mission statement 3. Rules for and examples of exceptional service 4. How to evaluate service performance	

Sample Performance Task

Standards: This sample performance task targets the following Hospitality, Tourism, and Recreation industry sector foundation standards and Hospitality, Tourism, and Recreation pathway standards:

Standard number	Standards
Foundation: Problem Solving and Critical Thinking 5.1	Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.

Standard number	Standards
Pathway: HTR C2.2	Understand how the mission and goals of a business affect operations in the hospitality, tourism, and recreation industry.
Pathway: HTR C3.1	Understand the importance of guest service to the success of the industry.
Pathway: HTR C3.2	Understand the concept of exceptional guest service.
Pathway: HTR C3.3	Anticipate the needs, desires, and interests of guests in order to exceed their expectations.
Pathway: HTR C3.6	Interact with guests in a positive, responsive, and professional manner.

Assignment: In your cooperative learning group (Leadership and Teamwork 9.3), your job is to:

1. Write a one-page description of a hypothetical hotel in one of the following categories: limited service, midmarket, first class, or luxury. Include the following (HTR C3.1):
   a. Description of the hotel's facilities, incorporating the following:
      - List of physical facilities
      - Total number of rooms
      - Guest service provided
      - Pet policies
      - Amenities
   b. Mission statement for delivering exceptional guest service that will create repeat business (HTR C2.2; HTR C3.1; HTR C3.2)
2. Create for employees a one-page quick-reference fact sheet for delivering exceptional guest service. Have a front-office manager review and evaluate the fact sheet (HTR C3.2; Problem Solving and Critical Thinking 5.1).
3. Develop and write a guest-service scenario in which a front-desk employee delivers exceptional guest service while checking in one of the following (HTR C3.2; HTR C3.3; HTR C3.6):
   a. A family of four: mother, father, five-year-old son, thirteen-year-old daughter
   b. A person with a disability requiring the use of a wheelchair
   c. An older couple (over seventy years of age) on their second honeymoon
   d. A couple in their thirties with two pet poodles
4. Videotape the enactment of your scenario for the rest of the class to watch. All students will grade the presentation, using the exceptional-service fact sheet that you created.
5. Write a 200-word report in which you explain the following:
   a. At least six reasons why guest service and exceptional guest service are important (HTR C3.1)
   b. The part of this project that helped you to understand the concept of delivering exceptional guest service and why (HTR C3.2)
   c. What resources you used to develop both the fact sheet and the guest service scenario

Performance task rubric: Your grade will be based on the following rubric. Individual teachers should determine how to weight the standards and assign points for each level.

Standards	Advanced	Proficient	Basic	Unacceptable
HTR C2.2: Understand how the mission and goals of a business affect operations in the hospitality, tourism, and recreation industry.	Mission statement is written concisely and effectively and reflects the level of service expected in the chosen lodging facility.	Mission statement is written concisely to reflect the level of service expected in the chosen lodging facility.	Mission statement reflects a general rather than a specific level of service.	Mission statement does not discuss the level of service. Or the mission statement is inappropriate for the chosen lodging facility.
HTR C3.1: Understand the importance of guest services to the success of the industry.	Mission statement and written report indicate clear understanding of the importance of guest service to the success of the industry. Written report gives eight specific examples that apply to the customers and setting of the scenario.	Mission statement and written report indicate clear understanding of the importance of guest service to the success of the industry. Written report gives six specific examples that apply to the customers and setting of the scenario.	Mission statement and written report indicate clear understanding of the importance of guest service to the success of the industry. Written report gives four examples.	Mission statement does not adequately address guest services. Written report does not mention the importance of guest service or does not give at least four examples.
HTR C3.2: Understand the concept of exceptional guest service.	In all elements the student shows a clear understanding of the difference between acceptable, above-average, and exceptional guest service. Mission statement provides a definition of excellent customer service that is easily understood and applied by every employee. Written report provides a clear, thorough definition and four examples of exceptional guest service.	In all elements the student shows a clear understanding of the difference between acceptable and exceptional guest service. Mission statement provides a definition of excellent customer service that can be understood and applied by every employee. Written report provides a clear, thorough definition and three examples of exceptional guest service.	Mission statement provides a definition of excellent customer service. Written report provides a clear, thorough definition and two examples of exceptional guest service.	Mission statement does not include a useful, correct definition of excellent customer service. Written report does not contain a definition of exceptional guest service. Or the definition is sketchy or inaccurate. Or there are fewer than two examples given.

Standards	Advanced	Proficient	Basic	Unacceptable
HTR C3.3: Anticipate the needs, desires, and interests of guests in order to exceed their expectations.	Questions asked by scenario employee were insightful and allowed employee to gather information needed to exceed guest's expectations. Interactions with guests showed an awareness of the probable specific needs and interests of each customer.	Questions asked by scenario employee were appropriate to gather information needed to meet guest's expectations. Interactions with guests showed an awareness of the probable specific needs of each customer.	Scenario employee asked only basic, standard information and waited for guest to volunteer information related to his or her specific needs.	Questions asked by scenario employee were inappropriate. Or no questions were asked.
HTR C3.6: Interact with guests in a positive, responsive, and professional manner.	The student at all times interacts with guests in a positive, responsive, and professional manner. The student provides equal and exceptional service to all customers. The class ranks the student in the videotaped scenario as providing exceptional service. The student's behavior is appropriate to the highest level of professionals working in the field.	The student interacts with guests in a positive, responsive, and professional manner. The student provides equal and exceptional service to all customers. The class ranks the student in the videotaped scenario as providing mostly exceptional service. The student's behavior is appropriate to the average level of professionals working in the field.	The student interacts with guests in a positive, responsive, and professional manner. The student provides equal and exceptional service to all customers. The class ranks the student in the videotaped scenario as providing mostly above-average or average service.	The student's interactions with guests are not always positive, responsive, or professional. The student does not treat customers equally or make an effort to provide exceptional service to all customers. The class ranks the student in the videotaped scenario as providing mostly below-average service.
Problem Solving and Critical Thinking 5.1: Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.	Problem-solving strategies and critical thinking skills are demonstrated and show a comprehensive understanding of procedures that are appropriate for scenario.	Problem-solving strategies and critical thinking skills are demonstrated and show a basic understanding of procedures that are appropriate for scenario.	Some problem-solving strategies and critical thinking skills are demonstrated and show some comprehensive understanding of procedures that are appropriate for scenario.	Problem-solving strategies and critical thinking skills are absent and inappropriate for scenario.

Standards	Advanced	Proficient	Basic	Unacceptable
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.	Teacher observes student taking leadership in organizing group work and individual work effectively.	Teacher observes student helping to organize group work and structuring individual work effectively.	Teacher observes student following the group work plan and adequately structuring individual work.	Teacher observes little or no student involvement in group work plan or in structuring individual work.

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Hospitality, Tourism, and Recreation Pathway Occupations	
High school (diploma)	• Host/Hostess/Waitstaff • Camp Counselor • Recreation Leader • Spa Attendant • Front-Desk Worker
Postsecondary training (certification and/or AA degree)	• Concert Promoter • Event/Wedding Planner* • Specialty Cook • Flight Attendant • Club Professional or Manager
College or university (bachelor's degree or higher)	• Theme Park Director • Convention Coordinator • Travel Company Owner/Manager • Club/Resort/Hotel Manager

Notes

1. California Travel and Tourism Commission, Division of Tourism, *California Fast Facts,* 2006. http://www.gocalif.ca.gov/state/tourism
2. Katharine Kim, "National Restaurant Association Announces Record Sales Projected in Year Ahead for Nation's Largest Private-Sector Employer," December 14, 2004. http://www.restaurant.org/pressroom/pressrelease.cfm?ID=979
3. California Restaurant Association, *California Fast Facts: News and Information,* 2005. http://www.calrest.org/newsinfo/fastfacts.asp

Information Technology Industry Sector

Information Technology (IT) careers involve the design, development, support, and management of hardware, software, multimedia, and systems integration services. The IT industry offers a dynamic and entrepreneurial working environment that has had a revolutionary impact on the economy and on society. IT careers are available not only in the IT industry but also in every other sector of the economy, from Agriculture and Natural Resources to Transportation. Employment for IT support specialists is expected to increase faster than the average for all other occupations (by 18.5 percent by 2012) as organizations continue to adopt and integrate increasingly sophisticated technology. The IT sector contains some of the fastest-growing industries, such as software publishing, Internet publishing, service providers, Web search portals, and data-processing services.

Information Technology careers are divided into four pathways: Information Support and Services, the foundation of all successful business organizations today; Media Support and Services, involving the creation, design, and production of multimedia products and services; Network Communications, involving network analysis, planning, and implementation; and Programming and Systems Development, involving the design, development, and implementation of computer systems and software.

Information Technology Sector Pathways:

- Information Support and Services
- Media Support and Services
- Network Communications
- Programming and Systems Development

Information Support and Services

Sample sequence of courses in the Information Support and Services pathway:

CTE courses	Related courses
Introductory • Keyboarding • Computer Applications • Business Communications	• Word Processing • Spreadsheet • Database Presentations
Concentration • Office Technology	
Capstone • Microsoft Office Specialist Certification	

Sample of appropriate foundation and pathway standards for the Computer Applications course in the Information Support and Services pathway:

Foundation standards

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 1.3: Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 1.8: Design and publish documents by using advanced publishing software and graphic programs.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.5: Write business letters:

a. Provide clear and purposeful information and address the intended audience appropriately.
b. Use appropriate vocabulary, tone, and style to take into account the nature of the relationship with, and the knowledge and interests of, the recipient.
c. Highlight central ideas or images.
d. Follow a conventional style with page formats, fonts, and spacing that contribute to the document's readability and impact.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting):

a. Report information and convey ideas logically and correctly.
b. Offer detailed and accurate specifications.
c. Include scenarios, definitions, and examples to aid comprehension (e.g., trouble-shooting guide).
d. Anticipate readers' problems, mistakes, and misunderstandings.

Communications 2.4 Listening and Speaking (grades eleven and twelve) 2.4: Deliver multimedia presentations:

a. Combine text, images, and sound and draw information from many sources.
b. Select an appropriate medium for each element of the presentation.
c. Use the selected media skillfully, editing appropriately and monitoring for quality.
d. Test the audience's response and revise the presentation accordingly.

Foundation standards	**Career Planning and Management 3.1:** Know the personal qualifications, interests, aptitude, knowledge, and skills necessary to succeed in careers.
	Technical Knowledge and Skills 10.0: Students understand the essential knowledge and skills common to all pathways in the Information Technology sector.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway standards	**IT A1.0:** Students understand the potential impact of information systems in different organizations.
	IT A3.0: Students understand important aspects of project management.
	IT A7.0: Students understand software applications and life-cycle phases.
	IT A8.0: Students understand the importance of reading, writing, and comprehending documentation in a technical environment.

Sample analysis ("unpacking") of a standard for the Computer Applications course in the Information Support and Services pathway:

Standard	**Information Technology A7.0:** Students understand software applications and life-cycle phases.	
Standard subcomponent	**Information Technology A 7.1:** Know common industry-standard software and its applications.	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Know the industry-standard software programs for word processing. 2. Know the industry-standard software programs for spreadsheets. 3. Know the industry-standard software programs for presentations. 4. Know the industry-standard software programs for databases.	*Benchmarks* 1. Cite two word-processing programs and identify their strengths and differences. 2. Cite two programs for spreadsheets and identify their strengths and differences. 3. Cite two presentation programs and identify their strengths and differences. 4. Cite two database programs and identify their strengths and differences.
What should students be able to do? At what level?	*Skills* 1. How to create an electronic presentation 2. How to use a word-processing program	*Benchmarks* 1. Create an electronic presentation with imported photos and graphics; various transitions. 2. Use a word-processing program to write a short report.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–4 2. How to create an electronic/multimedia presentation 3. How to use a word-processing program	

Sample Performance Task

Standards: This sample performance task targets the following Information Technology sector foundation and Information Support and Services pathway standards:

Standard number	Standards
Foundation: Communications 2.4 Listening and Speaking (grades eleven and twelve) 2.4	Deliver multimedia presentations: a. Combine text, images, and sound and draw information from many sources. b. Select an appropriate medium for each element of the presentation. c. Use the selected media skillfully, editing appropriately and monitoring for quality. d. Test the audience's response and revise the presentation accordingly.
Foundation: Career Planning and Management 3.1	Know the personal qualifications, interests, aptitude, knowledge, and skills necessary to succeed in careers.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway: IT A7.1	Know common industry-standard software and its applications.

Assignment: Select and research a career that interests you (Career Planning and Management 3.1). Use an industry-standard word-processing program to write a short report (1,000 words) on what career you selected and why you are interested in that career (IT A7.1; Career Planning and Management 3.1).

Prepare a ten-minute overview of your exploration of yourself and your career choice. The format will be an oral presentation with industry-standard presentation software, with a minimum of 12 slides. It must include at least one imported digital photograph taken at school. Other slides, including ones downloaded from the Internet, may also be used. Photographs and graphics should be included, but your slides should not be cluttered. Use a consistent theme for backgrounds and color choices to make your presentation professional in appearance (IT A7.1; Communications 2.4 Listening and Speaking 2.4).

Electronic presentation slides:

1	Introduction slide, including your name, title of presentation
3–5	Slides with information about you (likes, dislikes, hobbies, interests)
6–12	Slides with description of career selected, reasons for choosing it, educational requirements, qualifications, advantages and disadvantages, reasons why you think you would be successful in that career

Performance task rubric: Your grade will be based on the following rubric.

Standards	Advanced	Proficient	Basic	Unacceptable
IT A7.1: Know common industry-standard software and its applications. (60 points)	Report is prepared in correct format with industry-standard software. Twelve slides include all necessary visual, graphic, and organizational elements. Additional slides with high levels of transitions and animation are included. The student uses advanced features of the software to add visual appeal and interest. (60 points)	Report is prepared in correct format with industry-standard software. Twelve slides include all necessary visual, graphic, and organizational elements. The slides have features such as background designs and transitions. (50 points)	Report or slide show uses industry-standard software but is missing one to three required visual, graphic, and organizational elements. (30 points)	Report or slide show demonstrates minimal effort or does not use industry-standard software. (10 points)
Communications 2.4 Listening and Speaking (grades eleven and twelve) 2.4: Deliver multimedia presentations. (20 points)	The slide show enhances the presentation by providing concise and interesting information. The slides have no grammatical or typographical errors. The presentation is up to professional standards in both appearance and delivery. (20 points)	The slide show enhances the presentation by providing concise and interesting information, and there are one or two grammatical or typographical errors. (10 points)	The slide show enhances the presentation by providing information in a concise and interesting way. However, the slides have two to four grammatical or typographical errors. (5 points)	The slide show detracts from the presentation. It is disorganized, unprofessional, or inappropriate. There are more than four grammatical or typographical errors. (2 points)
Career Planning and Management 3.1: Know the personal qualifications, interests, aptitude, knowledge, and skills necessary to succeed in careers. (20 points)	The report describes the career in detail, including qualifications, educational requirements, and advantages and disadvantages. The student links the qualifications closely to personal interests and aptitudes. The report includes interviews with people in the career area as well as traditional research. (20 points)	The report describes the career in detail, including qualifications, educational requirements, and advantages and disadvantages. The student links the qualifications to personal interests and aptitudes. (10 points)	The report's description of the career is minimal and does not include all items required. The student does not relate the career's qualifications to personal interests and aptitudes. (5 points)	The report's description of the career is inaccurate or incomplete. (2 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Information Support and Services Pathway Occupations	
High school (diploma)	• Administrative Assistant • Help Desk Support Technician • Word Processing Operator
Postsecondary training (certification and/or AA degree)	• Desktop Publisher • Information Systems Specialist • Database Administrator • Technical Writer
College or university (bachelor's degree or higher)	• Software Engineer Applications • Information Systems Architect • Information Technology Manager/Director • Chief Technology Officer • Business Teacher*

Media Support and Services

Sample sequence of courses in the Media Support and Services pathway:

CTE courses	Related courses
Introductory • Computer Applications • Introduction to Business • Introduction to Desktop Publishing	• Graphic Design
Concentration • Desktop Publishing • Web Design	
Capstone • Multimedia and Image Management • Advanced Web Design	

Sample of appropriate foundation and pathway standards for the Multimedia and Image Management course in the Media Support and Services pathway:

Foundation standards

Communications 2.1 Reading Comprehension (grades nine and ten) 2.6: Demonstrate use of sophisticated learning tools by following technical directions (e.g., those found with graphic calculators and specialized software programs and in access guides to World Wide Web sites on the Internet).

Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 2.6: Deliver descriptive presentations:

a. Establish clearly the speaker's point of view on the subject of the presentation.
b. Establish clearly the speaker's relationship with that subject (e.g., dispassionate observation, personal involvement).
c. Use effective, factual descriptions of appearance, concrete images, shifting perspectives and vantage points, and sensory details.

Foundation standards	**Technology 4.0:** Students know how to use contemporary and emerging technological resources in diverse and changing personal, community, and workplace environments.
	Problem Solving and Critical Thinking 5.0: Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques.
	Technical Knowledge and Skills 10.0: Students understand the essential knowledge and skills common to all pathways in the Information Technology sector.
	Technical Knowledge and Skills 10.7: Analyze the functions, features, and limitations of different operating systems, environments, applications, and utilities.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**IT B1.0:** Students understand the effective use of tools for media production, development, and project management.
	IT B2.0: Students understand the effective use of communication software to access and transmit information.
	IT B3.0: Students understand the use of different types of peripherals and hardware appropriate to media and technology.

Sample analysis ("unpacking") of a standard for the Multimedia and Image Management course in the Media Support and Services pathway:

Standard	**Information Technology B1.0:** Students understand the effective use of tools for media production, development, and project management.	
Standard subcomponent	**Information Technology B1.2:** Use appropriate software to design and produce professional-quality images, documents, and presentations.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. What data mapping is 2. What tools are available in data-mapping software 3. What purpose a data map can serve for a business 4. How businesses use data-mapping programs	*Benchmarks* 1. Give a basic definition of *data mapping.* 2. Cite three standard data-mapping tools. 3. Cite five purposes of a data map and give examples. 4. Cite five data-mapping programs and explain how a business would use each program.
What should students be able to do? At what level?	*Skills* 1. Search for different types of data-mapping software. 2. Determine what is available on the Internet compared with software that can be installed directly on a computer. 3. Analyze findings from Internet research on various data-mapping software.	*Benchmarks* 1. Identify three types of data-mapping software, using at least three resources. 2. Identify at least three types of data-mapping software available on the Internet and three that can be installed directly on a computer. 3. Use research findings to compare and contrast features of the data-mapping software.

Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–4 2. Creating a visual display of available software 3. Comparing and contrasting features and costs of available software

Sample Performance Task

Standards: This sample performance task targets the following Information Technology industry sector foundation and Media Support and Services pathway standards:

Standard number	Standards
Foundation: Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 2.6	Deliver descriptive presentations: a. Establish clearly the speaker's point of view on the subject of the presentation. b. Establish clearly the speaker's relationship with that subject (e.g., dispassionate observation, personal involvement). c. Use effective, factual descriptions of appearance, concrete images, shifting perspectives and vantage points, and sensory details.
Foundation: Technical Knowledge and Skills 10.7	Analyze the functions, features, and limitations of different operating systems, environments, applications, and utilities.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: IT B1.0	Students understand the effective use of tools for media production, development, and project management.

Assignment: In this assignment you will analyze data-mapping software used for business purposes. Work in small groups or by yourself to complete the following steps. You will:

1. Locate and analyze various data-mapping software used by business (IT B1.0).
   a. Use your computer and varied resources, such as magazines from your classroom and library.
   b. List five data-mapping software programs available for business use.
2. Determine the function and purpose of the selected programs for various applications (IT B1.0].
   a. Cite the purpose for each data-mapping software application and explain how each program would be used in business.
   b. Provide an example of each purpose (to be accomplished by cutting pictures out of magazines and/or printing a sample from software or the Internet).
3. Cite your findings by creating a display board or poster showing each software application and describe the tools for your selected business, using your collection of pictures.
   a. Determine appropriate pictures to be displayed.
   b. Provide captions explaining how each program would be used in business.
4. Critique the tools used in each example and give a brief (three- to five-minutes) persuasive talk to a group about which software they should purchase for your selected

business use (Communications 2.4 Listening and Speaking Strategies and Applications 2.6; Technical Knowledge and Skills 10.7).

a. Determine the type of business that will use the software.
b. Determine the contents of the persuasive talk.
c. Develop presentation for a group.

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
IT B1.0: Students understand the effective use of tools for media production, development, and project management. (70 points)	All relevant information about five sample mapping software programs is included, and all tools in each program are cited and evaluated. Mapping tools are demonstrated with professional clarity and thoroughness, with appropriate terminology, visuals, and tools applied for business use. (70 points)	Most relevant information about five sample mapping software programs and most of the tools used in each program is included. Mapping tools are demonstrated with clarity. The student is able to use common, familiar, and most newly acquired terminology correctly and uses visuals to demonstrate tools applied for business use. (60 points)	Most relevant information about three sample mapping software programs and the basic tools used in each program is included. Mapping tools are demonstrated through visuals, including tools applied for business use; but the demonstration is incomplete or unclear. (40 points)	The assignment includes fewer than three sample mapping programs, or the tool list is either incomplete or absent. Mapping concepts demonstration is incomplete, unclear, or missing. (0 points)
Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 2.6: Deliver descriptive presentations. (15 points)	Arguments and ideas are accurate and complete and are delivered in a logical fashion; the listeners' concerns are anticipated and addressed; the speaker's position is presented in a clear and precise manner. (15 points)	Arguments and ideas are mostly accurate and nearly complete and are delivered in a logical fashion; the listeners' concerns are anticipated and addressed; the speaker's position is presented in a clear and precise manner. (10 points)	Arguments and ideas are somewhat accurate and complete and are delivered in a logical fashion; the listeners' concerns may not be anticipated and addressed; the speaker's position is presented in a clear and precise manner. (5 points)	Arguments and ideas are inaccurate and incomplete and are not delivered in a logical fashion; the listeners' concerns are not anticipated or addressed; the speaker's position is not presented in a clear and precise manner. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Technical Knowledge and Skills 10.7: Analyze the functions, features, and limitations of different operating systems, environments, applications, and utilities. (15 points)	Analysis of mapping tools, functions, and features is thorough and detailed and focuses on the business applications of the software with specific, detailed examples. The analysis completely communicates the processes observed and measured. (15 points)	Analysis of mapping tools, functions, and features is general and focuses on the business applications of the software. The analysis communicates the processes observed and measured. (10 points)	Analysis of mapping tools, functions, and features lacks detail and focus on business applications. The analysis does not successfully communicate the processes observed and measured. (5 points)	Analysis of mapping tools, functions, and features is incomplete or missing. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry.

Media Support and Services Pathway Occupations	
High school (diploma)	• Computer Operator • Production Technician • Web Page Developer
Postsecondary training (certification and/or AA degree)	• Computer Graphic Artist • Desktop Publisher • Multimedia Specialist • Web Designer • Webmaster
College or university (bachelor's degree or higher)	• Graphic Designer • Multimedia Artist/Animator • Multimedia Producer • Web Architect • Corporate Communications Manager

Network Communications

Sample sequence of courses in the Network Communications pathway:

CTE courses	Related courses
Introductory • Keyboarding • Computer Applications	• Entrepreneurship • Technical Business Communications
Concentration • Advanced Computer Operations • Network Systems I	
Capstone • Network Systems II	

Sample of appropriate foundation and pathway standards for the Network Systems I course in the Network Communications pathway:

Foundation standards	**Academics 1.1 Mathematical Reasoning (grade seven) 1.1:** Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
	Academics 1.1 Mathematical Reasoning (grade seven) 2.2: Apply strategies and results from simpler problems to more complex problems.
	Academics 1.2 Investigation and Experimentation 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.
	Communications 2.1 Reading Comprehension (grades nine and ten) 2.5: Extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration.
	Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting): a. Report information and convey ideas logically and correctly. b. Offer detailed and accurate specifications. c. Include scenarios, definitions, and examples to aid comprehension (e.g., troubleshooting guide). d. Anticipate readers' problems, mistakes, and misunderstandings.
	Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.3: Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.
	Technical Knowledge and Skills 10.1: Know how to use a variety of business- and industry-standard software and hardware, including major proprietary and open standards.
Pathway standards	**IT C1.0:** Students understand how to identify and analyze the customer's organizational network system needs and requirements.
	IT C2.0: Students understand and use various types of networking models.
	IT C3.0: Students understand network maintenance and user-support services.

Sample analysis ("unpacking") of a standard for the Network Systems I course in the Network Communications pathway:

Standard	**Information Technology C2.0:** Students understand and use various types of networking models.	
Standard subcomponent	**Information Technology C2.1:** Know the types of networks and their features and applications.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. What a computer network is 2. Types of computer networks 3. The features of the computer networks 4. The advantages and disadvantages of each of the different types of networks 5. What network operating systems are available 6. The advantages and disadvantages of each of the network operating systems	*Benchmarks* 1. Cite the basic definition of *computer networks.* 2. Identify four types of computer networks. 3. Identify at least three features for each type of computer network. 4. Identify at least two advantages and two disadvantages for each type of network. 5. Identify four network operating systems. 6. List at least two advantages and two disadvantages of each of the network operating systems.
What should students be able to do? At what level?	*Skills* 1. How to analyze findings from research on computer networks 2. How to apply findings to customer needs 3. How to share network information with customers	*Benchmarks* 1. Research three computer networks and present features of each in a comparison chart. 2. Compare features of a given computer network with mock-scenario customer needs and requirements. 3. Present research findings and recommendations in a clear and concise manner to mock-scenario customer.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–6 2. Researching information both electronically and in reference materials 3. Reaching conclusions that match computer network system with the needs of the customer	

Sample Performance Task

Standards: This sample performance task targets the following Information Technology industry sector foundation and Network Communications pathway standards:

Standard number	Standards
Foundation: Communications 2.1 Reading Comprehension (grades nine and ten) 2.5	Extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration.
Foundation: Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.3	Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.
Foundation: Technical Knowledge and Skills 10.1	Know how to use a variety of business- and industry-standard software and hardware, including major proprietary and open standards.
Pathway: IT C2.0	Students understand and use various types of networking models.

Assignment: You work for a technology consulting firm that provides technology assistance to area businesses for networking and telecommunication problems. ABC Company is a local business with two stores. It also sends supplies nationwide to customers, using a toll-free number to place their orders. The company is considering adding a Web site to facilitate the ordering process for its customers. It has hired the consulting firm you work for to provide it with information on the type of network that would best serve its needs as well as the network operating system that would benefit the company the most (IT C2.0).

A meeting has been set up with the owners, store managers, accountant, and warehouse supervisor. They want you to make a presentation on networks and operating systems. To do so, you must:

1. Research the various types of networks available, including the features of each, the vendor for each, and the advantages and disadvantages of each (IT C2.0; Communications 2.1 Reading Comprehension 2.5).
2. Analyze the needs of the company, given the handout your teacher has prepared. You may also interview a company representative (the teacher) to get more information or clarify questions you may have.
3. Prepare a PowerPoint presentation showing your recommendation to the customer and the reasons you support that choice. Include the costs for a 15-station network (IT C2.0; Communications 2.2 Writing Strategies and Applications 1.3; Technical Knowledge and Skills 10.1).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
IT C2.1: Know the types of networks and their features and applications. (50 points)	Product analysis demonstrates extensive research of types of networks and operating systems that meet company needs, including detailed features, advantages, and disadvantages of each. (50 points)	Product analysis demonstrates adequate research of types of networks and operating systems that meet company needs, including most features, advantages, and disadvantages of each. (40 points)	Product analysis demonstrates some research of types of networks and operating systems that meet company needs, including basic features, advantages, and disadvantages of each. (30 points)	Product analysis demonstrates some research of types of networks and operating systems but does not address or consider the needs of the company. (10 points)
Communications 2.1 Reading Comprehension (grades nine and ten) 2.5: Extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration. (20 points)	Product analysis and presentation demonstrate extensive research, including interview of company representative. The analysis is detailed and evaluates different products in relation to customer needs. The recommendation is thoroughly justified and includes cost and vendor information. (20 points)	Product analysis and presentation demonstrate adequate research, including interview of company representative. The analysis is basic but evaluates different products in relation to customer needs. The recommendation is justified and includes cost and vendor information. (15 points)	Product analysis and presentation demonstrate some research. The analysis is basic, and the product evaluation does not address specific needs of the company. (10 points)	Product analysis and/or presentation is inaccurate or incomplete. No recommendation is given. (5 points)
Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.3: Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples. (20 points)	Slide show conveys detailed information in a concise, persuasive manner, with extensive supporting information and relevant examples. The recommendation is persuasive, given the research. (20 points)	Slide show conveys information in a concise manner, with supporting information and relevant examples. The recommendation is given with supporting reasons. (8 points)	Slide show conveys information with some supporting information. The information may be incomplete or inaccurate. A recommendation is given but without supporting reasons for choice. (6 points)	Slide show information is incomplete and inaccurate, and no recommendation is given. (2 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Technical Knowledge and Skills 10.1: Know how to use a variety of business- and industry-standard software and hardware, including major proprietary and open standards. (10 points)	Student uses industry-standard software to prepare detailed slide presentation with appropriate background design, slide transitions, and graphics. Detailed charts and graphs of research information are included. (10 points)	Student uses industry-standard software to prepare slide presentation with appropriate background design, slide transitions, and graphics. Charts of research information are included. (8 points)	Student uses industry-standard software to prepare slide presentation incorporating basic information from research. (6 points)	Student uses software to prepare slide presentation, but information is inaccurate and incomplete. (2 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry.

Network Communications Pathway Occupations	
High school (diploma)	• Network Systems Assistant • Network Support Technician
Postsecondary training (certification and/or AA degree)	• Software/Hardware Installer • Telecommunications Specialist • Network Administrator • Data Communications Specialist
College or university (bachelor's degree or higher)	• Network Administrator • Computer Security Specialist • Network Engineer • Network Project Manager • Network Manager/Director

Programming and Systems Development

Sample sequence of courses in the Programming and Systems Development pathway:

CTE courses	Related courses
Introductory • Computer Applications • Exploratory Business • Introduction to Programming	• HTML Programming • Web Programming • Probability and Statistics
Concentration • Programming and Software Development • Java Programming • Visual Basic Programming • Computer Programming	
Capstone • Game Programming • Advanced Programming • AP Computer Science	

Sample of appropriate foundation and pathway standards for the Computer Programming course in the Programming and Systems Development pathway:

Foundation standards	**Academics 1.1 Algebra I (grades eight through twelve) 5.0:** Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
	Technology 4.2: Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.
	Problem Solving and Critical Thinking 5.0: Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques.
	Problem Solving and Critical Thinking 5.3: Use critical thinking skills to make informed decisions and solve problems.
	Technical Knowledge and Skills 10.0: Students understand the essential knowledge and skills common to all pathways in the Information Technology sector.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**IT D1.0:** Students understand the strategies necessary to define and analyze systems and software requirements.
	IT D2.0: Students understand programming languages.
	IT D3.0: Students understand the creation and design of a software program.
	IT D4.0: Students understand the process of testing, debugging, and maintaining programs to meet specifications.

Sample analysis ("unpacking") of a standard for the Computer Programming course in the Programming and Systems Development pathway:

Standard	**Information Technology D2.0:** Students understand programming languages.	
Standard subcomponent	**Information Technology D2.1:** Know the fundamentals of programming languages and concepts.	
Course level	❑ Introductory ☒ Concentration ❑ Capstone	
What do students need to know? At what level?	*Concepts* 1. The definition of *variables* 2. Why variables differ in algebra and computer programming 3. What actions can be taken with variables 4. Identification of codes	*Benchmarks* 1. Cite the basic definition of *variables*. 2. Cite differences between variables in algebra and computer programming. 3. Cite five actions that can be taken, with variables. Give examples. 4. Identify three samples of code snippets.
What should students be able to do? At what level?	*Skills* 1. How to display variables within code 2. How to create code, using variables	*Benchmarks* 1. Complete simple searches, using a variety of resources. 2. Write a 20-line code snippet that effectively and accurately uses three types of variables.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–4 2. How to create code, using variables	

Sample Performance Task

Standards: This sample performance task targets the following Information Technology industry sector foundation and Programming and Systems Development pathway standards:

Standard number	Standards
Foundation: Technology 4.2	Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.
Foundation: Problem Solving and Critical Thinking 5.3	Use critical thinking skills to make informed decisions and solve problems.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: IT D2.1	Know the fundamentals of programming languages and concepts.

Assignment: Understanding Computer Variables

You spend weeks learning about variables—the most important fundamental you will need to understand in algebra. Then you go to computer class and have to learn all over again what a variable is. Although computer variables and algebraic variables are referred to as the

same and are given the same description (e.g., x and y), they are not the same. Consider the following statement, which is correct if you are a computer programmer but has no solution if you are a mathematician: I = I + 1. If you are a mathematician, the statement suggests that there might be a number equal to one more than itself. But if you are a computer programmer, it means to start with a certain value and add one to it—a perfectly legal computer instruction. To a computer programmer a variable is a place to store a piece of information. Just as you might store a friend's telephone number in your own memory, you can store this information in a computer's memory. Variables allow you to access your computer's memory.

For this activity you will need beads or marbles or some other small objects and a desk organizer (one of those cabinets with little drawers for paper clips and thumbtacks). Then you will:

1. Label each drawer with a letter (e.g., X, Y, Z). The drawers represent variables. This is a reasonable comparison because—unlike an algebraic variable—a computer variable is nothing more than a place to store something. Specifically, it is a place to store a value. The value stored in each variable will be represented by the marbles. In the beginning, each variable is empty because you have not stored anything in it.
2. Read the following snippet of code and, with a partner, talk through this piece of code as described (Technology 4.2).

Direction set:

Code snippets	Explanations of code process	Actions taken
1. X = 7	The first instruction says to store seven marbles in drawer X.	Put seven marbles in drawer X.
2. Y = 2	The second instruction says to store two marbles in drawer Y.	Put two marbles in drawer Y.
3. Z = X – Y	The third instruction says to find out how many marbles are in drawer X and subtract the number of marbles in drawer Y and put that many marbles in drawer Z.	Open drawer X again and count the marbles. Write the number.
		Open drawer Y and count the marbles. Write the number.
		7 – 2 = 5. Put 5 marbles in drawer Z.
4. Y = X – 6	The fourth instruction says to find out how many marbles are in drawer X and subtract six from that number. Remove all marbles in drawer Y and put in one.	Once again, count how many marbles are in drawer X. Write the number.
		Write out the calculation 7 – 6 = 1.
		Take out all marbles in drawer Y and put one in drawer X.
5. Y = Y + 1	The last instruction says to find out how many marbles are in drawer Y.	Write out the calculation 1 + 1 = 2.
	And that is how many marbles we are supposed to have in drawer Y.	Empty drawer Y. Then put in 2 marbles.

3. Write three code snippets once you have advanced through this process, manually putting marbles in and taking them out. Have your partner carry out the actions called for, using the resources (IT D2.1; Problem Solving and Critical Thinking 5.3).
4. Write six code snippets (using pencil and paper) along with your partner as shown in the previous set of directions. Include the explanation of each step in the code process and the action taken (IT D2.1; Problem Solving and Critical Thinking 5.3).

Performance task rubric: Your grade will be based on the following rubric:

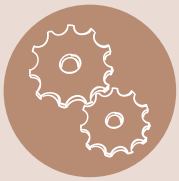
Standards	Advanced	Proficient	Basic	Unacceptable
IT D2.1: Know the fundamentals of programming languages and concepts. (80 points)	Provides six samples of code snippets, with detailed explanations of each step in the coding process and appropriate identification of the action taken. Code snippets demonstrate a high degree of understanding through visuals, including appropriate tools applied for business use. (80 points)	Provides six samples of code snippets, including adequate explanation of each step in the coding process and identification of the action taken. Code snippets demonstrate the ability to use common, familiar, and most newly acquired terminology correctly through visuals, including appropriate tools applied for business use. (65 points)	Provide six samples of code snippets, with minimal explanation of each step in the coding process and identification of the action taken. Code snippets demonstrate some capacity through visuals, including appropriate tools applied for business use, but lack completeness and clarity. (40 points)	Samples are incomplete, unclear, or entirely absent. (0 points)
Technology 4.2: Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services. (10 points)	Teacher observes student accessing and using resources effectively and with ease. (10 points)	Teacher observes student being assisted with accessing and using resources of other students. (8 points)	Teacher observes student following partner's lead in accessing and using resources. (5 points)	Teacher observes student not accessing and using resources. (0 points)
Problem Solving and Critical Thinking 5.3: Use critical thinking skills to make informed decisions and solve problems. (10 points)	Code snippets and actions are analyzed in detail, allowing the instructor to measure the quality of the process easily and accurately. (10 points)	Code snippets and actions are analyzed, but the quality of the process needs better communication. (8 points)	Code snippets and actions are analyzed, but the analyses lack detail, and some are weak. (5 points)	Code snippets and action features are partially analyzed or are missing. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry.

Programming and Systems Development Pathway Occupations	
High school (diploma)	• Software Applications Support • Programmer • Software Technician
Postsecondary training (certification and/or AA degree)	• Programmer • Software Documentation Specialist • Software Applications Reporting
College or university (bachelor's degree or higher)	• Operating Systems Designer • Computer Software/Hardware Engineer • Software Architect • Manager of Software Development • Chief Software Architect

Manufacturing and Product Development Industry Sector



The Manufacturing and Product Development industry sector is an important part of California's economy, producing a wide range of products, including computers, communications equipment, electronic components, high-tech instruments, apparel, metal products, chemicals, plastics, aircraft, ships, missiles and space products, and search and navigation equipment. Both large and small manufacturers are important participants in the electronics, multimedia, and other emergent regional industrial clusters.

This sector provides a foundation in manufacturing processes and systems for all industrial and technology education students in California. These students are engaged in an instructional program that integrates technical preparation and academics with career awareness, career exploration, and skill preparation in four pathways: Graphic Arts Technology, Integrated Graphics Technology, Machine and Forming Technology, and Welding Technology. Manufacturing and Product Development pathways emphasize real-world, occupationally relevant experiences of significant scope and depth in manufacturing and graphic communication. To prepare students for the vast range of career opportunities in manufacturing and product development, middle schools, high schools, regional occupational centers and programs, apprenticeship programs, community colleges, and four-year colleges and universities provide educational and training programs.

Manufacturing and Product Development Industry Sector Pathways:

- Graphic Arts Technology
- Integrated Graphics Technology
- Machine and Forming Technology
- Welding Technology

Graphic Arts Technology

Sample sequence of courses in the Graphic Arts Technology pathway:

CTE courses	Related courses
Introductory • Exploring Technology • Technology Core • Drafting • Orientation to Graphic Arts Apprenticeship	• Commercial Art • Principles of Technology • English Composition • Computer Science/Applications • Algebra
Concentration • Graphic Arts/Communications • Communications Technology • Photography Laboratory	
Capstone • Composition, Lithography, and Platemaking • Composition, Makeup, and Typesetting • Desktop Publishing • Commercial Photography	

Sample appropriate foundation and pathway standards for the Graphic Arts/Communications course in the Graphic Arts Technology pathway:

Foundation standards	**Academics 1.4 Visual Arts proficient (grades nine through twelve) 2.3:** Develop and refine skill in the manipulation of digital imagery (either still or video).
	Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents: a. Report information and convey ideas logically and correctly. b. Offer detailed and accurate specifications. c. Include scenarios, definitions and examples to aid comprehension (e.g., troubleshooting guide). d. Anticipate readers' problems, mistakes, misunderstandings.
	Technology 4.2: Understand the use of technological resources to gain access to, manipulate, and produce information, products, and services.
	Responsibility and Flexibility 7.1: Understand the qualities and behaviors that constitute a positive and professional work demeanor.
	Technical Knowledge and Skills 10.7: Understand how graphic arts processes produce visual images to inform, educate, and serve manufacturing and personal needs.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**MPD A2.0:** Students understand graphic arts functions and copy preparation, including applications of desktop publishing and electronic imaging software.
	MPD A3.0: Students understand image generation processes and procedures required to reproduce single-color and multicolor printing.

Pathway standards	**MPD A5.0:** Students understand the functions, processes, and procedures required for the reproduction of printed products and the factors affecting the image transfer process.
	MPD A8.0: Students understand contemporary photography and its applications.
	MPD A9.0: Students understand the proper health and safety procedures and guidelines for the graphic arts environment, including the storage and recycling of raw materials and waste products.

Sample analysis ("unpacking") of a standard for the Graphic Arts/Communications course in the Graphic Arts Technology pathway:

Standard	**Manufacturing and Product Development A2.0:** Students understand graphic arts functions and copy preparation, including applications of desktop publishing and electronic imaging software.	
Standard subcomponent	**Manufacturing and Product Development A2.3:** Know desktop publishing and electronic imaging software principles and procedures used to prepare graphic arts products.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Available desktop publishing and electronic imaging software packages and their capabilities, advantages, and disadvantages 2. Computer-based photographic retouching materials and techniques 3. Strategies for effective presentation, using retouching process and products	*Benchmarks* 1. List five software suites typically used for desktop publishing and electronic imaging, with capabilities, advantages, and disadvantages of each. 2. Cite digital materials and techniques used to remove dust spots, add or replace missing color information, replace missing parts of the image. 3. Use three original images and retouched copies of each image to determine the degree of retouching success in color, sharpness and detail, and composition achieved, using an identified retouching process on each image.
What should students be able to do? At what level?	*Skills* 1. Retouching photographs, using image-editing program; removing dust spots; adding or replacing missing color information; replacing missing parts of the image 2. Identifying appropriate software tools for specific image editing problems.	*Benchmarks* 1. Use image-editing program to resolve problems on three photographs. Remove dust spots, add or replace missing color information, replace missing parts of the image. 2. Select and effectively use retouch software and provide specific reasons for your selection as to capabilities, advantages, and disadvantages of the software.
Topics and contexts **What must be taught?**	1. Basic knowledge of image editing and desktop-publishing software 2. Each step of the process of resolving image-editing problems through digital retouching techniques 3. Effective presentation strategies and skills	

Sample Performance Task

Standards: This sample performance task targets the following Manufacturing and Product Development industry sector foundation standards and Graphic Arts Technology pathway standards:

Standard number	Standards
Foundation: Academics 1.4 Visual Arts proficient (grades nine through twelve) 2.3	Develop and refine skill in the manipulation of digital imagery (either still or video).
Foundation: Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6	Write technical documents: a. Report information and convey ideas logically and correctly. b. Offer detailed and accurate specifications. c. Include scenarios, definitions, and examples to aid comprehension (e.g., troubleshooting guide). d. Anticipate reader's problems, mistakes, and misunderstandings.
Foundation: Responsibility and Flexibility 7.1	Understand the qualities and behaviors that constitute a positive and professional work demeanor.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: MPD A2.3	Know desktop publishing and electronic imaging software principles and procedures used to prepare graphic arts products.
Pathway: MPD A8.1	Understand current photographic technologies, processes, and materials used in the graphic arts.

Assignment: Work in teams of three to employ an image-editing process to retouch photographs and remove dust spots, add or replace missing color information, and replace missing parts of the photographs (MPD A8.1). Take the following steps:

1. *Research:* Use the library and classroom reference materials to develop an understanding of retouching technologies, processes, and materials in digital photography (MPD A8.1; Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.6).
2. *Materials:* Identify through research the retouching software your team will be using. Given a set of prints, select three and their digital equivalents. You will need access to a computer loaded with the team-selected software (MPD A8.1; Demonstration and Application 11.0).
3. *Criteria:* Examine each of the three digital photographs carefully and decide which need to be retouched. Are there dust spots or scratches? Is the color faded? Can you tell what the original color was supposed to be? Write down all of the problems affecting each photograph and list next to them what each solution will be. Call this document your "Road Map to Retouching" and turn it in with your finished retouching projects (MPD A2.3; MPD A8.1; Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.6; Demonstration and Application 11.0).
4. *Procedure:* Retouch a copy of each image, not the original. Your work before and after can then be examined. Use screen shots to help clarify your process and ease of understanding. Use a word-processing program to print out your "Road Map to Retouching."

Use correct grammar and spelling (MPD A2.3; MPD A8.1; 1.4 Visual Arts proficient [grades nine through twelve] 2.3; Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.6; Demonstration and Application 11.0).

5. *Final report.* Discuss how you arrived at your retouching decisions. Include a copy of your "Road Map to Retouching." Refer to the original photographs and your retouched copies when describing what the image problems were and how you accomplished each retouching task (MPD A8.1; Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.6; Responsibility and Flexibility 7.1; Demonstration and Application 11.0).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
MPD A2.3: Know desktop publishing and electronic imaging software principles and procedures used to prepare graphic arts products. (30 points)	In the "Road Map to Retouching," student identifies appropriate software and techniques for each flaw or issue identified in original photographs and images, demonstrating extensive familiarity with software and procedures. Student uses each technique efficiently and skillfully, with minimal help from teacher or classmates. (30 points)	In the "Road Map to Retouching," student identifies appropriate software and techniques for each flaw or issue identified in original photographs and images, demonstrating familiarity with software and procedures. Student uses each technique skillfully but requires help from teacher or classmates. (25 points)	In the "Road Map to Retouching," student identifies appropriate software and techniques for some flaws and issues identified in original photographs and images, demonstrating limited familiarity with software and procedures. Student applies each technique with difficulty and requires substantial help from teacher or classmates. (15 points)	In the "Road Map to Retouching," student selects inappropriate software or techniques for flaws or issues in original photographs and images. Student cannot use techniques without extensive help from teacher or classmates. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
MPD A8.1: Understand current photographic technologies, processes, and materials used in the graphic arts. (25 points)	The project report, including the "Road Map to Retouching," reflection paragraph, work, and results, displays a complete understanding of the problems in the photographs used, the origins of those problems, the processes and materials available to correct such problems, the reasons each process or material might be chosen, and the potential advantages and limitations of the software and hardware available to the student. (25 points)	The project report, including a "Road Map to Retouching," reflection paragraph, work, and results, displays an understanding of at least three of the following four elements: the problems in the photographs used, the origins of those problems, the processes and materials available to correct such problems, the reasons each process or material might be chosen, and the potential advantages and limitations of the software and hardware available to the student. (17 points)	The project report, including a "Road Map to Retouching," reflection paragraph, work, and results, displays an understanding of at least two of the following four elements: the problems in the photographs used, including the origins of those problems, the processes and materials available to correct such problems, the reasons each process or material might be chosen, and the potential advantages and limitations of the software and hardware available to the student. (8 points)	The project report, including a "Road Map to Retouching," reflection paragraph, work, and results, does not demonstrate understanding of the problems in the photographs used, including the origins of those problems, the processes and materials available to correct such problems, the reasons each process or material might be chosen, and the potential advantages and limitations of the software and hardware available to the student. (0 points)
Academics 1.4 Visual Arts proficient (grades nine through twelve) 2.3: Develop and refine skill in the manipulation of digital imagery (either still or video). (15 points)	Three images were skillfully retouched through a selected image-editing process. Color, composition, sharpness, and detail were restored, with all flaws corrected. The resulting retouched images are at a professional or near-professional standard. (15 points)	Three images were retouched through a selected image-editing process. Color, composition, sharpness, and detail were restored, with all flaws corrected. The results were not suitable for professional work but are of high quality, without detectable errors, graininess, or digital artifacts. (10 points)	Two or three images were retouched through a selected image-editing process. Most color, composition, sharpness, and detail were restored, but flaws were left uncorrected. The final images visibly still require further retouching. (5 points)	The images were not retouched, or the processes used yielded images that are visibly of lower quality than the original images. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents. (15 points)	The final report and "Road Map to Retouching" are well written, with detailed examples. Reflection is well written, thoughtful, and complete. (15 points)	The final report and "Road Map to Retouching" are fairly well written, with examples. Reflection is complete. (10 points)	The final report and "Road Map to Retouching" are poorly organized, with limited examples. Reflection is incomplete, vague, or absent. (5 points)	Student fails to write the report, the "Road Map to Retouching," or reflection on assignment. (0 points)
Responsibility and Flexibility 7.1: Understand the qualities and behaviors that constitute a positive and professional work demeanor. (15 points)	Student demonstrates enthusiasm, focus, and maturity throughout the project. Student is always on task. (15 points)	Student demonstrates enthusiasm, focus, and maturity most of the time. Student is almost always on task. (10 points)	Student works some of the time but wastes significant periods of project time, sometimes loses focus, becomes frustrated, or needs frequent reminders to stay on task. (5 points)	Student wastes most project time, loses focus, becomes frustrated, and/or ignores reminders to stay on task. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Graphic Arts Technology Pathway Occupations	
High school (diploma)	• Desktop Publisher • Graphic Art Equipment Operator • Network Installer* • Pre-Press Designer • Graphic Arts Apprentice
Postsecondary training (certification and/or AA degree)	• Commercial Photographer • Production Manager • Network Administrator* • Graphic Artist (Journeyman)
College or university (bachelor's degree or higher)	• Publisher, Editor • Product Developer • Industrial Technology Educator* • Network Engineer* • Graphic Designer

Integrated Graphics Technology

Sample sequence of courses in the Integrated Graphics Technology pathway:

CTE courses	Related courses
Introductory • Exploring Technology • Drafting/ Communications • Technology Core • Graphic Arts • Graphic Communications Apprenticeship Awareness	• Principles of Technology • Principles of Design • Commercial Photography • Journalism • Algebra
Concentration • Video Production • Communications Technology • Photography Laboratory • Graphic Communications • Graphic Communications Apprenticeship Explorations	
Capstone • Animation • Broadcasting Production • Multimedia • Orientation to Graphic Communications Apprenticeship	

Sample of appropriate foundation and pathway standards for the Exploring Technology course in the Integrated Graphics Technology pathway:

Foundation standards

Academics 1.1 Number Sense (grade seven) 1.2: Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.3: Write expository compositions, including analytical essays and research reports:

a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives.
b. Convey information and ideas from primary and secondary sources accurately and coherently.
c. Make distinctions between the relative value and significance of specific data, facts, and ideas.
d. Include visual aids by employing appropriate technology to organize and record information on charts, maps, and graphs.
e. Anticipate and address readers' potential misunderstandings, biases, and expectations.
f. Use technical terms and notations accurately.

Communications 2.4 Listening and Speaking Strategies and Applications (grades eleven and twelve) 1.8: Use effective and interesting language, including:

a. Informal expressions for effect
b. Standard American English for clarity
c. Technical language for specificity

Foundation standards	**Communications 2.5:** Understand the importance of technical and computer-aided design, drawing, and graphic technologies essential to the language of the industry; read, interpret, and create drawings, sketches, and schematics by using manufacturing and product development industry conventions and standards; interpret and understand detailed information provided from technical documents, both print and electronic, and experienced people; and use computers, calculators, multimedia equipment, and other devices in a variety of applications.
	Technology 4.1: Understand past, present, and future technological advances as they relate to a chosen pathway.
	Problem Solving and Critical Thinking 5.2: Understand the systematic problem-solving models that incorporate input, process, outcome, and feedback components.
	Responsibility and Flexibility 7.1: Understand the qualities and behaviors that constitute a positive and professional work demeanor.
	Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
	Technical Knowledge and Skills 10.6: Apply the design process in the development, evaluation, and refinement of a manufacturing prototype.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**MPD B1.0:** Students understand the application of basic integrated graphic design principles to achieve specific goals.
	MPD B2.0: Students understand integrated graphic multimedia functions and applications of electronic imaging software.
	MPD B5.0: Students understand integrated graphic multimedia technologies.

Sample analysis ("unpacking") of a standard for the Exploring Technology course in the Integrated Graphics Technology pathway:

Standard	**Manufacturing and Product Development B1.0:** Students understand the application of basic integrated graphic design principles to achieve specific goals.	
Standard subcomponent	**Manufacturing and Product Development B1.1:** Produce sketches, rough layouts, and comprehensive layouts for an integrated graphic product, using design principles to guide the process.	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Design and function of various animation devices 2. Concept of persistence of vision 3. Importance of producing a variety of sketches and rough layouts as part of the design process 4. Understanding of the role of form, function, and color in producing sketches and layouts	*Benchmarks* 1. Define *zoetrope, phenakistascope, praxinoscope,* and *mutoscope* and describe how they function. 2. Explain the phenomenon of persistence of vision and give examples. 3. Provide three sketches or rough layouts for a potential project, with adequate accompanying written documentation. 4. Describe a selected design in terms of form, function, and color choices.

What should students be able to do? At what level?	*Skills* 1. Produce accurately scaled sketches and layouts. 2. Work within material parameters to produce feasible designs. 3. Develop appropriate sketch sequences for animated strips or discs.	*Benchmarks* 1. Produce a sketch or layout for a given project which shows correct proportioning and accurate dimensions to a given scale. 2. Complete one design model from sketches or layouts within material parameters. 3. Produce animated sequence that plays correctly in a given device.
Topics and contexts **What must be taught?**	1. Ideation and graphic design process leading to model development 2. The use of graphic design principles in sketches, rough layouts, and comprehensive layouts 3. Basics of sequencing and the animation process	

Sample Performance Task

Standards: This sample performance task targets the following Manufacturing and Product Development industry sector foundation and Integrated Graphics Technology pathway standards:

Standard number	Standards
Foundation: Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.3	Write expository compositions, including analytical essays and research reports: a. Marshall evidence in support of a thesis and related claims, including information on all relevant perspectives. b. Convey information and ideas from primary and secondary sources accurately and coherently. c. Make distinctions between the relative value and significance of specific data, facts, and ideas. d. Include visual aids by employing appropriate technology to organize and record information on charts, maps, and graphs. e. Anticipate and address readers' potential misunderstandings, biases, and expectations. f. Use technical terms and notations accurately.
Foundation: Technology 4.1	Understand past, present, and future technological advances as they relate to a chosen pathway.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
Foundation: Technical Knowledge and Skills 10.6	Apply the design process in the development, evaluation, and refinement of a manufacturing prototype.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: MPD B1.1	Produce sketches, rough layouts, and comprehensive layouts for an integrated graphic product, using design principles to guide the process.

Assignment: Work in groups of two or three to create a functional animation device and short animation. Take the following steps:

1. Read the handout on the persistence of vision and review the unit on animation. Conduct research on an early manual stop-motion animation device. Understand how the device works and how it fits into the history of animation (Technology 4.1).
2. Create a working model of a zoetrope, phenakistascope, praxinoscope, or mutoscope from the materials provided (MPD B1.1; Leadership and Teamwork 9.3; Technical Knowledge and Skills 10.6) as follows:
   a. Sketch three potential designs for your animation device. Each should be made to scale and be properly dimensioned. Make effective use of design principles and the materials provided.
   b. Choose one of the sketches to produce.
   c. Construct a working model from the chosen sketch and the provided materials.
3. Design an animated strip or disc to be played in your model (MPD B1.1; Leadership and Teamwork 9.3; Technical Knowledge and Skills 10.6). You will:
   a. Develop two possible options for the content of the animation strip or disc and create rough sketches. Animation should be no more than five seconds and no fewer than two seconds in duration.
   b. Choose the animation content to be produced.
   c. Produce the animation strip or disc as follows:
      (1) Registration should be accurate.
      (2) Image sequencing should be accurate.
      (3) Depicted movement should be smooth and consistent.
      (4) Animation should play within the given time period.
4. Write a research paper of at least 500 words (Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.3; Leadership and Teamwork 9.3). You will:
   a. Include a cover sheet.
   b. Cite at least two sources.
   c. Discuss the historical context of the animation device.
   d. Discuss the function and style of the working model in reference to design principles.
   e. Explain how persistence of vision works in your model and animation.
   f. Explain the design reasoning behind the animated strip or disc.

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
MPD B1.1: Produce sketches, rough layouts, and comprehensive layouts for an integrated graphic product, using design principles to guide the process. (25 points)	Sketches of animation device are skillfully penciled (even line widths; clean lines, arcs, circles), crisp (no smudges or erasure marks), to scale (full scale), and properly dimensioned (dimension lines, numbers, notes) and make effective use of design principles and the materials provided. Design is innovative and may be exceptionally durable, aesthetically pleasing, or exhibit other unique positive design qualities. Animation strip displays proper registration and sequencing. Movement is smooth and consistent. Animation is two to five seconds long. Animation tells a story or uses graphic elements in a thoughtful or unique manner. (25 points)	Sketches of animation device are well penciled (even line widths; clean lines, arcs, circles), crisp (few smudges or erasure marks), to scale (full scale), and properly dimensioned (most dimension lines, numbers, notes) and make effective use of design principles and the materials provided. Animation strip displays proper registration and sequencing. Movement is smooth and consistent. Animation is two to five seconds long. (20 points)	Sketches of animation device are penciled with adequate penciling (acceptable lines, arcs, circles; corrections or erasures marks apparent) to scale but may exhibit flaws in proportion or dimensioning. Use of design principles and provided materials is flawed or inconsistent but functional. Animation strip contains two to five minor flaws in registration and sequencing. Movement may be jerky or inconsistent. Animation is two to five seconds long. (15 points)	Sketches are incomplete, exhibiting rough to sloppy penciling, are not to scale, or do not produce functional working models. Animation strip is incomplete and nonfunctional or contains major flaws. (0 points)
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.3: Write expository compositions. (15 points)	Paper is at least 500 words long and includes a cover page and more than two properly cited sources.	Paper is at least 500 words long and includes a cover page and two properly cited sources.	Paper is at least 500 words long and includes a cover page and two properly cited sources.	Paper is incomplete and incoherent or does not cite at least two sources.

Standards	Advanced	Proficient	Basic	Unacceptable
	Information is accurate and coherent. Facts, technical terms, and ideas related to persistence of vision and design reasoning are relevant and accurate, and the choice of model design and animation strip is explained well. Visual aids are employed effectively to convey information. (15 points)	Information is accurate and coherent. Facts, technical terms, and ideas related to persistence of vision and design reasoning are relevant and accurate, and the choice of model design and animation strip is explained well. (10 points)	Information is accurate but may be poorly presented or lacking in detail. Persistence of vision, design reasoning, and the choice of model design and animation strip are explained. (5 points)	Concepts are not discussed or developed sufficiently. (0 points)
Technology 4.1: Understand past, present, and future technological advances as they relate to a chosen pathway. (15 points)	Paper demonstrates thorough understanding of the chosen device in the context of animation history and technology. In-depth insight or examples of the technological and historical context are provided. (15 points)	Paper demonstrates thorough understanding of the chosen device in the context of animation history and technology. (10 points)	Paper demonstrates some understanding of the chosen device in the context of animation history or technology but does not discuss in depth. (5 points)	Paper does not demonstrate understanding of the chosen device in the context of animation history or technology. (0 points)
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals. (15 points)	Student sets and meets timelines, organizes materials, and completes assignments accurately before they are due. (15 points)	Student sets and meets timelines, organizes materials, and completes assignments on time and with accuracy. (10 points)	Student sets and meets timelines minimally organizes materials, and completes assignments with some confusion. (5 points)	Student struggles with setting and meeting timelines, organizing, or completing of assignments. Or assignment is completed inaccurately. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Technical Knowledge and Skills 10.6: Apply the design process in the development, evaluation, and refinement of a manufacturing prototype. (15 points)	Model is elegant and well crafted. Model functions efficiently and smoothly as designed. (15 points)	Model is well crafted. Model functions efficiently as designed. (10 points)	Model functions as designed. (5 points)	Model does not function. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Integrated Graphics Technology Pathway Occupations	
High school (diploma)	• Special Effects Animator • Desktop Publisher • Web Designer • Video Graphics Helper • Special Effects Apprentice
Postsecondary training (certification and/or AA degree)	• Special Effects Editor • Advertising Design • Webmaster • Multimedia /Digital Editor • Special Effects Journeyman
College or university (bachelor's degree or higher)	• Special Effects Engineer • Publications Management • Multimedia Author • Multimedia/Digital Producer • Industrial and Technology Educator*

Machine and Forming Technology

Sample sequence of courses in the Machine and Forming Technology pathway:

CTE courses	Related courses
Introductory • Exploring Technology • Metalworking • Technology Core • Drafting • Orientation to Machine and Forming Apprenticeship	• Applied Physics • Welding • Robotics • Computer-aided Drafting/Design • Algebra
Concentration • Plastics/Composites • Machine Shop • Manufacturing I • Sheet Metal • Ironworking	
Capstone • Plastics/Composites • Machine Tool Operations • Manufacturing II • Foundry/Metallurgy	

Sample of appropriate foundation and pathway standards for the Machine Tool Operations course in the Machine and Forming Technology pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.2:** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
	Academics 1.1 Number Sense (grade seven) 1.3: Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
	Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology to perform tests, collect data, analyze relationships, and display data.
	Problem Solving and Critical Thinking 5.1: Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
	Health and Safety 6.4: Understand the safe and appropriate use of tools and equipment in the school manufacturing facility.
	Technical Knowledge and Skills 10.5: Complete a comprehensive working sketch and drawing of a product to be produced.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**MPD C1.0:** Students understand the planning and layout operations used in machine tool and materials forming processes.
	MPD C2.0: Students understand how materials can be processed through the use of machine tools, such as milling, drilling, turning, and shaping machines, and forming equipment, such as dies, presses, and rolls.

Pathway standards	**MPD C5.0:** Students understand the purposes and processes of inspection and quality control in machining and forming manufacturing processes.
	MPD C6.0: Students understand various machining and forming manufacturing systems that require standard hand and machine tools.
	MPD C9.0: Students understand the development of emerging machining and forming technology systems.
	MPD C10.0: Students understand industrial forming processes and their application to specific types of materials.

Sample analysis ("unpacking") of a standard for the Machine Tool Operations course in the Machine and Forming Technology pathway:

Standard	**Manufacturing and Product Development C2.0:** Students understand how materials can be processed through the use of machine tools, such as milling, drilling, turning, and shaping machines, and forming equipment, such as dies, presses, and rolls.	
Standard subcomponent	**Manufacturing and Product Development C2.2:** Use machine tools, such as machine lathes, milling machines, drilling machines, power hacksaws, and band saws, and forming equipment, such as presses, brakes, ironworkers, and stake benches, to cut, shape, combine, and form manufactured parts or products that meet the standards of the National Institute of Metalworking Skills, the Manufacturing Skill Standards Council, or similar standards	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Material (ferrous, nonferrous, thermoplastic, extruded/cast bar, tubing) qualities 2. Turning operations 3. Measuring operations 4. Finishing operations	*Benchmarks* 1. Use knowledge of material qualities to explain why the selected material is most appropriate for a given task. 2. Explain the steps involved in and the machines and tools used during the safe and proper execution of the following machine tool operations: turning, facing, countersinking, boring, tapping, thread chasing, beveling. 3. Use a steel rule to measure the length of a turning, depth of a shoulder, or machined slot to within 0.032 inch. 4. Explain the unique sizing and functional quality of knurling as a finishing option.
What should students be able to do? At what level?	*Skills* 1. Turn material to a specified diameter. 2. Turn material to a specified thread relief. 3. Set gearbox and chase 18TPI.	*Benchmarks* 1. Turn diameter to within +/– 0.001 inch of target. 2. Turn thread relief to within +/– 0.001 inch of target. 3. Use the micrometer and three-wire technique to make the diameter of bolt thread measure at a +/– 0.025 inch tolerance.

Topics and contexts **What must be taught?**	1. Engine lathe setup and operations 2. Lathe tool design, grinding 3. Qualities of materials 4. Thread-chasing techniques and tools 5. Measuring with a steel rule to within 1/32 inch

Sample Performance Task

Standard: This sample performance task targets the following Manufacturing and Product Development industry sector foundation standards and Machine and Forming Technology pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Number Sense (grade seven) 1.2	Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
Foundation: Health and Safety 6.4	Understand the safe and appropriate use of tools and equipment in the school manufacturing facility.
Pathway: MPD C1.1	Interpret scaled machine tool and materials forming prints; gather design and materials information; perform calculations; and use the detail to plan, lay out, and produce parts or finished products that meet the standards of the National Institute for Metalworking Skills, the Manufacturing Skill Standards Council, or similar standards.
Pathway: MPD C2.2	Use machine tools, such as machine lathes, milling machines, drilling machines, power hacksaws, and band saws, and forming equipment, such as presses, brakes, ironworkers, and stake benches, to cut, shape, combine, and form manufactured parts or products that meet the standards of the National Institute of Metalworking Skills, the Manufacturing Skill Standards Council, or similar standards.
Pathway: MPD C5.2	Know how to perform continuous online quality control inspection of machine and formed parts.

Assignment: You will design and build a working prototype for a specialty storage container that meets specific working criteria, including making the part-to-print and producing it on schedule (MPD C1.1; MPD C2.2; MPD C5.2). You will select an appropriate material and finish for your prototype. The finished product must be part-to-print (MPD C1.1). Your product will:

1. Include one smooth-running, no interference 3/8 inch–16 thread with a maximum thread backlash of 0.001 inch (Academics 1.1 Number Sense [grade seven] 1.2; MPD C1.1; MPD C2.2).
2. Be produced from your choice of researched materials (MPD C1.1; MPD C2.2; Academics 1.1 Number Sense [grade seven] 1.2):
   a. Minimum wall thickness of 0.060 inch
   b. Minimum of two surface finishes
   c. Dimensions held to close tolerances

3. Follow your student-developed production schedule (MPD C5.2; Academics 1.1 Number Sense [grade seven] 1.2; Health and Safety 6.4):
   a. An online quality assurance schedule must be included.
   b. All safety procedures must be observed.

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
MPD C1.1: Interpret scaled machine tool and materials forming prints; gather design and materials information; perform calculations; and use the detail to plan, lay out, and produce parts or finished products that meet the standards of the National Institute for Metalworking Skills, the Manufacturing Skill Standards Council, or similar standards. (20 points)	Student successfully produces part-to-print container, with all machined tolerances held to +/– 0.001. (20 points)	Student successfully produces part-to-print container, with all machined tolerances held to +/– 0.025. (15 points)	Student successfully produces part-to-print container, with all machined tolerances held to +/– 0.005. (10 points)	Student successfully produces part-to-print container, with all machined tolerances held to +/– 0.006 or greater. (0 points)
MPD C2.2: Use machine tools, such as machine lathes, milling machines, drilling machines, power hacksaws, and band saws, and forming equipment, such as presses, brakes, ironworkers, and stake benches, to cut, shape, combine, and form manufactured parts or products that meet the standards of the National Institute of Metalworking Skills, the Manufacturing Skill Standards Council, or similar standards. (35 points)	Student follows proper machine tool protocols, as judged by the teacher, in performing ten container operations: chucking, facing, turning, grooving (slotting), thread chasing, cut-off, center drilling, drilling and tapping, live center turning, and finishing. No material waste is evident. No machine or tool damage occurs. (35 points)	Student follows proper machine tool protocols, as judged by the teacher, in performing nine or eight of ten container operations: chucking, facing, turning, grooving (slotting), thread chasing, cut-off, center drilling, drilling and tapping, live center turning, and finishing. Material waste is minimal. No machine or tool damage occurs. (25 points)	Student follows proper machine tool protocols, as judged by the teacher, in performing seven or six of ten container operations: chucking, facing, turning, grooving (slotting), thread chasing, cut-off, center drilling, drilling and tapping, live center turning, and finishing. Some material waste is evident. No machine or tool damage occurs. (15 points)	Student follows proper machine tool protocols, as judged by the teacher, in performing five or fewer of ten container operations: chucking, facing, turning, grooving (slotting), thread chasing, cut-off, center drilling, drilling and tapping, live center turning, and finishing. Material waste is evident. Machine or tool damage occurs. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
MPD C5.2: Know how to perform continuous online quality control inspection of machine and formed parts. (10 points)	Student employs step-by-step procedure sheet to conduct continuous, notated quality control inspection of machined parts. Five of five operations meet design specifications: facing, turning, machined threads, tapped threads, thread fit (end cap fit). (10 points)	Student employs step-by-step procedure sheet to conduct continuous, notated quality control inspection of machined parts. Four of five operations meet design specifications: facing, turning, machined threads, tapped threads, thread fit (end cap fit). (8 points)	Student employs step-by-step procedure sheet to conduct continuous, notated quality control inspection of machined parts. Three of five operations meet design specifications: facing, turning, machined threads, tapped threads, thread fit (end cap fit). (6 points)	Student employs step-by-step procedure sheet to conduct continuous, notated quality control inspection of machined parts. One or two of five operations meet design specifications: facing, turning, machined threads, tapped threads, thread fit (end cap fit). (0 points)
Academics 1.1 Number Sense (grade seven) 1.2: Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers. (15 points)	Student can convert measurements of 1/16, 1/8, 3/16, 1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8, 11/16, 3/4, 13/16, 7/8, and 15/16 inch to three-place decimal (0.XXX) equivalents from memory without error. (15 points)	Student can convert measurements of 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, and 7/8 inch to three-place decimal (0.XXX) equivalents from memory without error. (10 pts)	Student can convert measurements of 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, and 7/8 inch to three-place decimal (0.XXX) equivalents, using paper and pencil calculations with at least 90 percent accuracy. (5 points)	Student can convert measurements of 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, and 7/8 inch to three-place decimal (0.XXX) equivalents, using paper and pencil calculations with less than 90 percent accuracy. (0 points)
Health and Safety 6.4: Understand the safe and appropriate use of tools and equipment in the school manufacturing facility. (20 points)	Student demonstrates safe workplace practices in material handling, machine operations, and handling of tooling, fluids, and lubricants. Student wears proper eye protection at all times.	Student demonstrates safe workplace practices in material handling, machine operations, and handling of tooling, fluids, and lubricants. Student wears proper eye protection at all times.	Student demonstrates safe workplace practices in material handling, machine operations, and handling of tooling, fluids, and lubricants. Student wears proper eye protection at all times.	Student demonstrates safe workplace practices in material handling, machine operations, and handling of tooling, fluids, and lubricants. Student wears proper eye protection at all times.

Standards	Advanced	Proficient	Basic	Unacceptable
	Student maintains a clean work environment. Student achieves a score of 99–100 percent on a written 25-item engine lathe safety examination. (20 points)	Student maintains a clean work environment. Student achieves a score of 97–98 percent on a written 25-item engine lathe safety examination. (15 points)	Student maintains a clean work environment. Student achieves a score of 95–96 percent on a written 25- item engine lathe safety examination. (10 points)	Student maintains a clean work environment. Student achieves a score of less than 95 percent on a written 25-item engine lathe safety examination. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Machine and Forming Technology Pathway Occupations	
High school (diploma)	• Machine Operator • Maintenance Mechanic • Assembler • Installation Apprentice • Electro-Mechanical Helper
Postsecondary training (certification and/or AA degree)	• CNC Programmer • Machine Technician • Tooling Journeyman • Industrial Electrician* • Manager
College or university (bachelor's degree or higher)	• Manufacturing Engineer* • Mechanical Engineer* • Design Engineer • Tooling Engineer • Industrial Technology Educator*

Welding Technology

Sample sequence of courses in the Welding Technology pathway:

CTE courses	Related courses
Introductory • Technology Core • Metalworking • Welding Fundamentals • Exploring Technology • Orientation to Welding Apprenticeship	• Machining • Applied Physics • Robotics • Algebra • Geometrya
Concentration • Welding–Combination I • Welding Fabrication, Ironworking • Welding–Electric • Technical Drafting • Manufacturing/Materials Processing	
Capstone • Welding–Specialized • Foundry • Welding–Combination II • Computer aided Drafting • Computer-aided Manufacturing	

Sample of appropriate foundation and pathway standards covered in the Welding–Electric course in the Welding Technology pathway:

Foundation standards

Communications 2.4 Listening and Speaking Strategies and Applications (grade eight) 2.4: Deliver persuasive presentations:

a. Include a well-defined thesis (i.e., one that makes a clear and knowledgeable judgment).
b. Differentiate fact from opinion and support arguments with detailed evidence, examples, and reasoning.
c. Anticipate and answer listener concerns and counterarguments effectively through the inclusion and arrangement of detail, reason, examples, and other elements.
d. Maintain a reasonable tone.

Career Planning and Management 3.2: Understand the scope of career opportunities and know the requirements for education, training, and licensure.

Problem Solving and Critical Thinking 5.3: Use critical thinking skills to make informed decisions and solve problems.

Health and Safety 6.3: Know how to safely and appropriately handle, store, transport, transform, and dispose of hazardous and nonhazardous materials and chemicals in the school manufacturing facility.

Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.

Technical Knowledge and Skills 10.11: Understand the need to obtain and maintain industry-standard, technical certifications significant to an industry sector.

Pathway standards	**MPD D1.0:** Students understand the planning and layout operations used in welding processes.
	MPD D4.0: Students understand finishing processes and the differences between various types of finishing materials used in the manufacture of welded parts and products.
	MPD D5.0: Students understand the purposes and processes of inspection and quality control in welding manufacturing processes.
	MPD D9.0: Students understand how a manufacturing company is organized and the elements of welding production management.

Sample analysis ("unpacking") of a standard for the Welding–Electric course in the Welding Technology pathway:

Standard	**Manufacturing and Product Development D1.0:** Students understand the planning and layout operations used in welding processes.	
Standard subcomponent	**Manufacturing and Product Development D1.1:** Interpret scaled welding prints; gather design and materials information; perform calculations; and use the detail to plan, lay out, and produce parts or finished products.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Common welding symbols 2. Commonly used materials	*Benchmarks* 1. Define a list of 25 welding symbols on a written examination with 100 percent accuracy. 2. Identify ten commonly welded material samples by name and spell each name correctly by sample number on a written examination. Describe, in comparative terms, one advantage and one disadvantage (welding or end use) of each material.
What should students be able to do? At what level?	*Skills* 1. How to read a welding print 2. How to calculate costs for production 3. How to calculate tools and materials required for a project 4. How to calculate time required for a project	*Benchmarks* 1. Use a welding print to answer the teacher's questions about tolerances, finishing, materials, and fabrication with 100 percent accuracy. 2. Prepare a complete and accurate cost estimate for a sample production run when given details, materials costs, and quantities by the teacher. 3. Prepare a complete and accurate list of tools and materials required for a sample production run when given details by the teacher. 4. Prepare a reasonable time estimate for a sample production run when given details by the teacher.
Topics and contexts **What must be taught?**	1. How to interpret prints and gather design and materials information from them 2. Calculating project costs 3. Calculating resources necessary for production of parts or finished products	

Sample Performance Task

Standards: This sample performance task targets the following Manufacturing and Product Development industry sector foundation standards and Welding Technology pathway standards:

Standard number	Standards
Foundation: Communications 2.4 Listening and Speaking Strategies and Applications (grade eight) 2.4	Deliver persuasive presentations: a. Include a well-defined thesis (i.e., one that makes a clear and knowledgeable judgment). b. Differentiate fact from opinion and support arguments with detailed evidence, examples, and reasoning. c. Anticipate and answer listener concerns and counterarguments effectively through the inclusion and arrangement of details, reasons, examples, and other elements. d. Maintain a reasonable tone.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
Pathway: MPD D1.1	Interpret scaled welding prints; gather design and materials information; perform calculations; and use the detail to plan, lay out, and produce parts or finished products.
Pathway: MPD D4.1	Know the steps to be taken and the choices to be made in finishing welded materials.
Pathway: MPD D9.3	Know how scheduling, quality control, accident prevention, and inventory control are used efficiently and appropriately in a welding production management system.

Assignment: Traction Bars

1. *Design problem.* You and your production team have just completed a 50-unit run of traction bars for a customer who sells aftermarket custom car parts. The original order called for a primer finish. The customer has requested a change order, which will require that 20 units be prepared for chrome plating.
2. *Research/historical references.* Use the resource materials in the manufacturing laboratory library and the Internet and consult with local industry advisers to research metal plating and determine what problems must be considered that do not arise when a painted finish is all that is required (MPD D1.1; Leadership and Teamwork 9.3).
3. *Materials.* Determine, on the basis of your research, which (and what quantities) of the following you must have to prepare 20 parts properly for plating (MPD D1.1; Leadership and Teamwork 9.3):
   a. Power tools
   b. Hand tools
   c. Consumable materials

4. *Criteria:* Examine each of the 50 parts that your production team has completed and prepare a finishing schedule which includes all 50 parts. The schedule should include the following (MPD D4.1; MPD D9.3; Leadership and Teamwork 9.3):
   a. Criteria used to determine which 20 parts would be prepped for plating and which would receive primer
   b. What tools, consumables, or chemicals are to be used and in what order
   c. Who is responsible for each phase of the process
   d. How quality control will be ensured
   e. How much additional time and expense the preparation for plating will add to the manufacturing process
5. *Communication and presentation.* Present your production process design to the teacher and panel of community judges as if they were the contractor's representatives and your team is clarifying finish options and potential outcomes based on the change order. Remember that a good production team has already considered every issue that might be brought up before the presentation begins. Always be prepared to answer any questions about your proposal (Communications 2.4 Listening and Speaking Strategies and Applications [grade eight] 2.4; Leadership and Teamwork 9.3).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
MPD D1.1: Interpret scaled welding prints; gather design and materials information; perform calculations; and use the detail to plan, lay out, and produce parts or finished products. (20 points)	Research into metal plating and finish requirements is thorough and yields accurate estimates of the power tools, hand tools, and consumable materials required for the task. Extensive quality, cost, and durability differences between the options are clearly explained and understood with reference to scaled prints, researched information, and production processes. (20 points)	Research into metal plating and finish requirements yields accurate estimates of the power tools, hand tools, and consumable materials required for the task. Many quality, cost, and durability differences between the options are clearly explained and understood with reference to scaled prints, researched information, and production processes. (15 points)	Research into metal plating and finish requirements yields mostly accurate estimates of the power tools, hand tools, and consumable materials required for the task. Limited quality, cost, and durability differences between the options are clearly explained and understood with reference to scaled prints, researched information, and production processes. Some tools or materials may have been omitted or miscalculated. (10 points)	Research into metal plating and finish requirements is incomplete or yields inaccurate results. Numerous tools or materials may have been omitted or the amounts miscalculated. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
MPD D4.1: Know the steps to be taken and the choices to be made in finishing welded materials. (20 points)	The finishing schedule includes accurate and thoroughly explained estimates of time and materials required for the process and indicates the order in which steps should be taken. Criteria for part selection are clear, and students indicate to client in the presentation how much additional time and expense prep for plating will add to the manufacturing process and explain why. (20 points)	The finishing schedule includes accurate estimates of time and materials required for the process and indicates the order in which steps should be taken. Criteria for part selection are clear, and students indicate to client in the presentation how much additional time and expense prep for plating will add to the manufacturing process. (15 points)	The finishing schedule includes general or vague estimates of time and materials required for the process and indicates the order in which steps should be taken. Criteria for part selection and additional time and expense are mentioned but not fully explained. (10 points)	The finishing schedule does not include accurate estimates of time and materials required for the process or omits the order in which steps should be taken. Criteria for part selection and additional time and expense are not mentioned. (0 points)
MPD D9.3: Know how scheduling, quality control, accident prevention, and inventory control are used efficiently and appropriately in a welding production management system. (20 points)	The finishing schedule includes superior measures to ensure quality control. Each task is clearly assigned, and the schedule is comprehensive and professional. (20 points)	The finishing schedule provides some measures to ensure quality control. Each task is clearly assigned. (15 points)	The finishing schedule may lack clarity on task assignment or quality control measures or be difficult to interpret. (10 points)	The finishing schedule is incomplete or unusable. (0 points)
Communications 2.4 Listening and Speaking Strategies and Applications (grade eight) 2.4: Deliver persuasive presentations. (20 points)	Presentation is professional and persuasive. Facts and ideas are clearly supported with evidence, detail, and logic.	Presentation is competent and thorough. Facts and ideas are supported with evidence, detail and logic.	Presentation is poorly organized and not convincing. Facts and ideas are sometimes supported with evidence and logic but not consistently.	Presentation is incomplete or shows minimal effort. Or student does not make presentation. (0 points

Standards	Advanced	Proficient	Basic	Unacceptable
	Listener concerns (e.g., additional expense and cost) are anticipated and fully addressed within the presentation. (20 points)	Listener concerns (e.g., additional expense and cost) are addressed within the presentation or in questions. (15 points)	Most listener concerns (e.g., additional expense and cost) are addressed in questions. (10 points)	
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals. (20 points)	Student sets and meets timelines, organizes materials, and exhibits leadership in the group. Student completes assignments with accuracy before they are due. (20 points)	Student sets and meets timelines, organizes materials, and completes assignments with accuracy and on time. Student completes a full share of work. (15 points)	Student meets timelines, organizes materials, and completes assignments. Student may not participate fully in group work. (10 points)	Student struggles with setting and meeting timelines or hinders the group. Or student does not complete work on assignments. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Welding Technology Pathway Occupations	
High school (diploma)	• Welder • Cutter, Solder, Brazier • Welding Apprentice* • Plastics Assembler • Foundry Helper
Postsecondary training (certification and/or AA degree)	• Certified Welder* • Welding Journeyman* • Boilermaker* • Composite Fabricator • Foundry Core, Pattern Maker
College or university (bachelor's degree or higher)	• Manufacturing Engineer • Quality Control Inspector • Industrial Technology Educator* • Pressurized Vessel Engineer* • Fabrication Designer

Marketing, Sales, and Service Industry Sector

Marketing, the transfer of goods and services among businesses and consumers, affects the economy at every level. According to California occupational employment projections, retail trade will be the fastest-growing industry in the state.[1] And the U.S. Bureau of Labor Statistics projects that sales and related occupations will add two million new jobs nationwide by 2012, growing by 12.9 percent.[2] As businesses in America evolve to compete successfully in the global marketplace, a growing need exists for employees with business expertise and the ability to analyze and respond to emerging trends.

This sector is designed to prepare learners for careers in planning, managing, and performing marketing activities. Included are four career pathways: E-commerce, which provides instruction in using electronic tools to market products and services; Entrepreneurship, which develops skills and abilities to begin and operate a business independently or with other individuals; International Trade, which focuses on understanding the global business environment; and Professional Sales and Marketing, which builds knowledge of the sales process, sales management, and marketing information management.

Marketing, Sales, and Service Industry Sector Pathways:

- E-commerce
- Entrepreneurship
- International Trade
- Professional Sales and Marketing

E-commerce

Sample sequence of courses in the E-commerce pathway:

CTE courses	Related courses
Introductory • Financial Literacy • Keyboarding • Computer Applications • Business Communications • Exploratory Business • Introduction to Marketing	• Business Law • Economics • Entrepreneurship • Foreign Language • Internet Communication Systems
Concentration • Accounting • Finance • Business Management • Advanced Computer Applications • E-Commerce Marketing • Web Design • Principles of Marketing • Retail Marketing	
Capstone • Virtual Enterprise • International Business	

Sample of appropriate foundation and pathway standards for the E-commerce Marketing course in the E-commerce pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.7:** Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.
	Communications 2.3 Written and Oral English Language Conventions (grades nine and ten) 1.3: Demonstrate an understanding of proper English usage and control of grammar, paragraph and sentence structure, diction, and syntax.
	Problem Solving and Critical Thinking 5.0: Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques.
	Ethics and Legal Responsibilities 8.0: Students understand professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational norms.
	Technical Knowledge and Skills 10.0: Students understand the essential knowledge and skills common to all pathways in the Marketing, Sales, and Service sector.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**MSS A1.0:** Students understand the fundamental concepts of e-commerce.
	MSS A2.0: Students understand the decisions an e-commerce business makes in the development of products and services.

Pathway standards	**MSS A3.0:** Students understand important promotional strategies for communicating information about products, services, images, and ideas in an e-commerce environment.
	MSS A4.0: Students understand the purpose, process, and components of effective online sales and purchasing.
	MSS A5.0: Students understand the role of technology as it relates to e-commerce.

Sample analysis ("unpacking") of a standard for the E-commerce Marketing course in the E-commerce pathway:

Standard	**Marketing, Sales, and Service A4.0:** Students understand the purpose, process, and components of effective online sales and purchasing.	
Standard subcomponent	**Marketing, Sales, and Service A4.3:** Know various payment options for online purchases and their relative advantages and disadvantages for consumers and businesses.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. The generally accepted ways to accept payment from a consumer for items purchased on the Internet 2. How credit is established for online purchases 3. The advantages and disadvantages of generally accepted methods of payment to the consumer 4. The advantages and disadvantages of generally accepted methods of payment to the business	*Benchmarks* 1. Cite three methods of payment. 2. Cite the two methods of establishing credit. 3. Cite one advantage and one disadvantage to the consumer for each payment method and provide supporting rationale. 4. Cite one advantage and one disadvantage to the business for each payment method and provide supporting rationale.
What should students be able to do? At what level?	*Skills* 1. Research available payment options for online purchases. 2. Research methods of establishing credit. 3. Apply findings to determine how businesses and consumers benefit from payment options.	*Benchmarks* 1. Use at least three different sources, including the Internet, to conduct research on payment options. 2. Use at least three different sources, including the Internet, to conduct research on credit options. 3. Use findings to determine three benefits of payment options for businesses and consumers.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–4 2. Using research techniques to provide desired results 3. How to apply research findings to arrive at conclusions and make decisions	

Sample Performance Task

Standards: This sample performance task targets the following Marketing, Sales, and Service sector foundation standards and E-commerce pathway standards:

Standard number	Standards
Foundation: Communication 2.3 Written and Oral English Language Conventions (grades nine and ten) 1.3	Demonstrate an understanding of proper English usage and control of grammar, paragraph and sentence structure, diction, and syntax.
Pathway: MSS A4.1	Understand what motivates consumers to buy online.
Pathway: MSS A4.2	Understand the relationship between business ethics and consumer confidence in an e-commerce environment and its impact on the techniques used to build customer relationships.
Pathway: MSS A4.3	Know various payment options for online purchases and their relative advantages and disadvantages for consumers and businesses.
Pathway: MSS A4.4	Understand the methods used to provide Internet customers with product and service knowledge.

Assignment: This activity will explore the steps involved in purchasing a product online. Individually, you will perform the following steps:

1. Select a product currently located in a store (MSS A4.4).
2. Determine the steps involved in purchasing the product electronically and the process of getting that product from its location to the purchaser (MSS A4.4).
3. Write a report based on previous instruction and knowledge and additional research that will trace the journey of the product and include the following information (Communication 2.3 Written and Oral English Language Conventions [grades nine and ten] 1.3):
   a. Analysis of product selection, including a discussion of means of locating the product (MSS A4.1; MSS A4.4)
   b. Discussion of reasons a customer might purchase this particular product (MSS A4.1)
   c. Comparison of methods of online payment available in the Internet store selected and the security concerns involved with each (MSS A4.3)
   d. Discussion of ways in which business ethics might influence a consumer's decision to purchase the product because of the conduct and policies of the business (e.g., privacy policy) (MSS A4.2)
   e. Advantages and disadvantages of online shopping compared with shopping in a brick-and-mortar store (MSS A4.3)

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
MSS A4.1: Understand what motivates consumers to buy online. (20 points)	Report includes detailed explanations and justifications for buying products online and for purchasing this product. (20 points)	Report includes a list of reasons for buying products online and for purchasing this product. Explanations or justifications are adequate. (15 points)	Report includes limited lists of reasons for buying products online and for purchasing this product. Explanations or justifications are limited. (10 points)	Reasons and explanations are incomplete or inaccurate. (5 points)
MSS A4.2: Understand the relationship between business ethics and consumer confidence in an e-commerce environment and its impact on the techniques used to build customer relationships. (20 points)	Report includes a discussion of ethical business behavior and a comprehensive description of differences between ethical and unethical business behavior on the Internet. Connections are made between personal and professional ethics. Includes analysis of privacy issues involving the Internet. (20 points)	Report includes an adequate definition of ethical business behavior and a description of differences between ethical and unethical business behavior on the Internet. Connections are made between personal and professional ethics. (15 points)	Report includes a limited definition of ethical behavior and description of differences between ethical and unethical Internet behavior. (10 points)	Report includes limited definitions and descriptions, with limited analysis or explanation. (5 points)
MSS A4.3: Know various payment options for online purchases and their relative advantages and disadvantages for consumers and businesses. (30 points)	Report includes detailed descriptions of generally accepted payment options for online purchases and additional options. Report lists advantages and disadvantages for consumers and businesses, including security concerns. There is evidence of analysis in addition to listing. (40 points)	Report includes accurate descriptions of generally accepted payment options for online purchases. Report lists advantages and disadvantages for consumers and businesses, including security concerns. Supporting information is adequate. (30 points)	Report includes minimal descriptions of generally accepted payment options for online purchases. Report lists few advantages and disadvantages for consumers and businesses. Supporting information is minimal. (20 points)	Description and lists are incomplete or inaccurate. Supporting information is limited. (10 points)

Standards	Advanced	Proficient	Basic	Unacceptable
MSS A4.4: Understand the methods used to provide Internet customers with product and service knowledge. (10 points)	Report includes a thorough description of the process of finding and selecting the product to be purchased, including Internet search strategies. Report includes analysis of steps involved in purchasing the product. (10 points)	Report includes a description of the process of finding and selecting the product to be purchased, including Internet search strategies. Report includes list of steps involved in purchasing the product. (7 points)	Report includes a list of steps taken in finding and/or selecting the product to be purchased. Report includes list of steps involved in purchasing the product. (5 points)	Report identifies the product to be purchased. Report includes list of steps involved in purchasing the product. (2 points)
Communication 2.3 Written and Oral English Language Conventions (grades nine and ten) 1.3: Demonstrate an understanding of proper English usage and control of grammar, paragraph and sentence structure, diction, and syntax. (20 points)	Report is well written and logically organized, with no errors in spelling, grammar, or punctuation; has clarity of thought. (20 points)	Report is well written and logically organized, with few errors in spelling, grammar, or punctuation; has general clarity of thought. (15 points)	Report has few errors in spelling, grammar, or punctuation; has limited clarity of thought and organization and simple vocabulary. (10 points)	Report has errors in most areas of spelling, grammar, and punctuation; has minimal clarity of thought and organization and simple vocabulary. (5 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry.

E-commerce Pathway Occupations	
High school (diploma)	• Administrative Support Representative • Customer Service Representative • Customer Support Specialist
Postsecondary training (certification and/or AA degree)	• Account Supervisor • Copywriter-Designer • E-commerce Marketing Specialist • Forum Manager
College or university (bachelor's degree or higher)	• Brand Manager • E-commerce Director • E-commerce Entrepreneur • Interactive Sales Engineer • Business Teacher

Entrepreneurship

Sample sequence of courses in the Entrepreneurship pathway:

CTE courses	Related courses
Introductory • Financial Literacy • Keyboarding • Computer Applications • Business Communications • Exploratory Business • Introduction to Marketing	• Business Law • Economics • Technical Business Communications
Concentration • Accounting • Finance • Business Management • Principles of Marketing • Retail Marketing	
Capstone • Virtual Enterprise • Entrepreneurship	

Sample of appropriate foundation and pathway standards for the Virtual Enterprise course in the Entrepreneurship pathway:

Foundation standards

Academics 1.1 Number Sense (grade seven) 1.7: Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.

Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6: Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).

Ethics and Legal Responsibilities 8.0: Students understand professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational norms.

Leadership and Teamwork 9.0: Students understand effective leadership styles, key concepts of group dynamics, team and individual decision making, the benefits of workforce diversity, and conflict resolution.

Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.

Technical Knowledge and Skills 10.0: Students understand the essential knowledge and skills common to all pathways in the Marketing, Sales, and Service sector.

Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards	
	MSS B1.2: Understand the different types of business ownership and the advantages and disadvantages of owning and managing a small business.
	MSS B1.7: Know the elements of effective human resources management and how these practices benefit small businesses.
	MSS B2.1: Understand the reasons a small business develops a business plan.
	MSS B5.0: Students understand the key economic concepts that affect small business ownership.
	MSS B5.1: Understand the role and importance of entrepreneurship and the small business in the economy.

Sample analysis ("unpacking") of a standard for the Virtual Enterprise course in the Entrepreneurship pathway:

Standard	**Marketing, Sales, and Service B5.0:** Students understand the key economic concepts that affect small business ownership.	
Standard subcomponent	**Marketing, Sales, and Service B5.1:** Understand the role and importance of entrepreneurship and the small business in the economy.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Key economic concepts that affect small business ownership 2. Definition of *entrepreneurship* 3. The role of and importance of entrepreneurship and the small business in the economy.	*Benchmarks* 1. Cite at least five concepts and explain how they affect small business ownership. 2. Give the basic definition of *entrepreneurship.* 3. Discuss the role and importance of entrepreneurship and the small business in the economy at a level appropriate to a small business owner.
What should students be able to do? At what level?	*Skills* 1. Research and explain the key economic concepts that affect small business ownership. 2. Explain the role and importance of entrepreneurship and small business in the economy.	*Benchmarks* 1. Conduct research on key economic concepts and analyze their effect on small business ownership, demonstrating an understanding appropriate for a small business owner. 2. Research and apply prior knowledge to analyze the role and importance of entrepreneurship and small business in the economy.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–3 2. Techniques of conducting research to produce desired results 3. Interpreting information and drawing conclusions	

Sample Performance Task

Standards: This sample performance task targets the following Marketing, Sales, and Service sector foundation and Entrepreneurship pathway standards:

Standard number	Standards
Foundation: Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6	Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts in the foundation and pathway standards.
Pathway: MSS B5.1	Understand the role and importance of entrepreneurship and the small business in the economy.

Assignment: You are to investigate the contributions that local entrepreneurs have made to the surrounding communities and to the world economy. From the information you have studied so far, complete the following steps:

1. Learn important economic terms by researching definitions on the computer dictionary and participating in class discussion of terms (MSS B5.1).
2. Participate in your cooperative learning group by doing the following:
   a. Read the case study provided by your teacher and discuss the following questions (MSS B5.1):
      - How does the case study illustrate the concept of scarcity?
      - Do you agree or disagree with the opinion that in the United States people are free to make their own economic decisions? Justify your answer.
      - Are there any similarities between the speaker in the case study and the decisions made when operating a business? Explain your answer.

   b. Brainstorm and determine appropriate questions to use when interviewing local entrepreneurs (Leadership and Teamwork 9.3).
3. Use the list of questions to interview the entrepreneur selected by you or your teacher (Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 1.6).
4. Write a two- to three-page summary of the interview that includes responses to the questions and an analysis of the entrepreneur's contributions to the local economy and the world economy (Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 1.6; Demonstration and Application 11.0).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
MSS B5.1: Understand the role and importance of entrepreneurship and the small business in the economy. (60 points)	Summary includes responses to all questions. Data are correctly and thoroughly analyzed. Report is creative and engaging, correctly uses written language conventions, and shows insight into the economic impact of entrepreneurial ventures. (60 points)	Summary includes responses to all questions. Data are correctly analyzed. Report correctly uses written language conventions. (40 points)	Summary includes responses to all questions. Data are presented with minimal analysis. Report correctly uses written language conventions. (20 points)	Summary includes partial responses to questions. Data are not correctly analyzed. Writing does not correctly use written language conventions and includes errors. (10 points)
Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6: Develop presentations by using clear research questions and creative and critical research strategies. (20 points)	The information gathered reflects use of clear interview questions. Information is presented creatively and is well phrased, nonduplicative, thorough, and comprehensive. (20 points)	The information gathered reflects use of clear interview questions. Information presented is well phrased, nonduplicative, thorough, and fairly comprehensive. (15 points)	The information gathered reflects use of clear interview questions. Information presented is fairly well phrased, is somewhat duplicative, and has limited details. (10 points)	The information gathered reflects ineffective use of interview questions. Presentation is poorly phrased, with few details, or is partially or totally incomplete. (5 points)
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals. (20 points)	Student effectively demonstrates leadership in organizing group work and structuring individual work. (20 points)	Student helps to organize group work and structure individual work. (15 points)	Student participates in organizing group work and adequately structures individual work. (10 points)	Student does not participate in organizing group work or structuring individual work. (5 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Entrepreneurship Pathway Occupations	
High school (diploma)	• Customer Service Representative • Small Business Entrepreneur
Postsecondary training (certification and/or AA degree)	• Franchisee • Marketing Manager • Regional Sales Manager • Retail/Wholesale Buyer
College or university (bachelor's degree or higher)	• Chief Executive Officer • National Account Manager • Business Teacher* • Account Executive

International Trade

Sample sequence of courses in the International Trade pathway:

CTE courses	Related courses
Introductory • Financial Literacy • Keyboarding • Computer Applications • Business Communications • Exploratory Business • Introduction to Marketing	• Business Law • E-marketing • Economics • Entrepreneurship • Foreign Language
Concentration • Accounting • Finance • Business Management • Principles of Marketing • Retail Marketing	
Capstone • Virtual Enterprise • International Business	

Sample of appropriate foundation and pathway standards for the International Business course in the International Trade pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.7:** Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.
	Communications 2.3 Written and Oral English Language Conventions (grades nine and ten) 1.3: Demonstrate an understanding of proper English usage and control of grammar, paragraph and sentence structure, diction, and syntax.

Foundation standards	**Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 1.7:** Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.
	Problem Solving and Critical Thinking 5.0: Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques.
	Ethics and Legal Responsibilities 8.0: Students understand professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational norms.
	Leadership and Teamwork 9.0: Students understand effective leadership styles, key concepts of group dynamics, team and individual decision making, the benefits of workforce diversity, and conflict resolution.
	Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
	Technical Knowledge and Skills 10.0: Students understand the essential knowledge and skills common to all pathways in the Marketing, Sales, and Service sector.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**MSS C1.0:** Students understand the fundamental concepts of international business.
	MSS C2.0: Students understand how geographic, cultural, political, legal, historical, and economic factors influence international trade.
	MSS C3.0: Students understand the role of information technology in modern global trade.
	MSS C4.0: Students understand the logistics of importing and exporting products and services.

Sample analysis ("unpacking") of a standard for the Virtual Enterprise course in the International Trade pathway:

Standard	**Marketing, Sales, and Service C4.0:** Students understand the logistics of importing and exporting products and services.	
Standard subcomponent	**Marketing, Sales, and Service C4.1:** Explain direct and indirect distribution channels by identifying various distributions intermediaries and discussing their functions in international trade.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Definition of *direct and indirect distribution channels* 2. Definition of *distribution intermediaries* 3. Functions of distribution intermediaries in international trade	*Benchmarks* 1. Cite basic definition of *direct and indirect distribution channels.* 2. Define *distribution intermediaries* and cite examples. 3. Describe role and function of distribution intermediaries, citing in-depth, specific examples from the field.

	Skills	*Benchmarks*
What should students be able to do? At what level?	1. Conduct research on distribution channels. 2. Explain types of distribution channels. 3. Research distribution intermediaries and their functions. 4. Explain distribution intermediaries and their functions in international trade.	1. Identify distribution channels through appropriate research techniques at the eleventh- through twelfth grade level. 2. Explain distribution channels and cite in-depth, specific examples from the field. 3. Identify intermediaries through appropriate research techniques at the eleventh- through twelfth-grade level. 4. Use examples from the field to explain the functions of three distribution intermediaries.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–3 2. Using research techniques to provide desired results 3. Oral and written communication strategies and techniques for presenting clear, concise explanations and definitions	

Sample Performance Task

Standards: This sample performance task targets the Marketing, Sales, and Service sector foundation standards and International Trade pathway standards:

Standard number	Standards
Foundation: Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 1.7	Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
Pathway: MSS C4.1	Explain direct and indirect distribution channels by identifying various distribution intermediaries and discussing their functions in international trade.
Pathway: MSS C4.2	Explain how products are prepared for international distribution, including packing and documentation.
Pathway: MSS C4.3	Know the most appropriate methods of transporting various products.

Assignment: In your cooperative learning group, complete a project in which you consider the logistics of exporting an assigned product (Leadership and Teamwork 9.3). This assignment requires you to:

1. Research and explain direct and indirect distribution channels (MSS C4.1).
2. Research and explain how products are prepared for international distribution (MSS C4.2).
3. Research and discuss the most appropriate methods for transporting various products (MSS C4.3).

4. Recommend a method for transporting the assigned product, justifying your recommendation (MSS C4.3).
5. Prepare a presentation on your findings and recommendation, using your choice of electronic media and visual aids and including opportunities for each group member to participate (Communications 2.4 Listening and Speaking Strategies and Applications [grades nine and ten] 1.7).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
MSS C4.1: Explain direct and indirect distribution channels by identifying various distribution intermediaries and discussing their functions in international trade. (10 points)	Presentation provides an accurate and detailed overview of direct and indirect distribution channels. Student correctly identifies at least four types of distribution intermediaries and thoroughly discusses their functions in international trade, providing three or more specific examples for each type. (10 points)	Presentation provides an accurate and detailed overview of direct and indirect distribution channels. Student correctly identifies at least four types of distribution intermediaries and discusses their functions in international trade. (8 points)	Presentation provides an accurate overview of direct and indirect distribution channels. Student correctly identifies three types of distribution intermediaries and briefly and generally discusses their functions in international trade. (6 points)	Presentation does not include information on direct and indirect distribution channels. Or information included is inaccurate. Or fewer than three types of distribution intermediaries are correctly identified and discussed. (3 points)
MSS C4.2: Explain how products are prepared for international distribution, including packing and documentation. (15 points)	Presentation provides an accurate and detailed overview of how products are prepared for international distribution. Presentation includes specific examples of and references to packing and documentation. (15 points)	Presentation provides an accurate overview of how products are prepared for international distribution. Presentation includes specific examples. (10 points)	Presentation provides an accurate but limited description of how products are prepared for distribution. Presentation includes limited or general examples. (5 points)	Presentation provides an extremely limited or inaccurate description of how products are prepared for distribution. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
MSS C4.3: Know the most appropriate methods of transporting various products. (35 points)	Presentation includes discussion of a large variety of transportation methods, a recommendation for transportation of the assigned product, and a convincing justification for the selection based on sound supporting information. (35 points)	Presentation includes discussion of a variety of transportation methods, a recommendation for transportation of the assigned product, and a justification for the selection along with supporting information. (30 points)	Presentation includes a limited discussion of transportation methods. Justification for transportation method has minimal supporting information. (15 points)	Presentation includes a very limited discussion of few transportation methods. Justification is absent or lacks supporting information. (5 points)
Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 1.7: Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy or presentations. (20 points)	Presentation includes very effective use of electronic media, along with at least two or more other visual aids (e.g., charts, handouts), and participation by all group members. (20 points)	Presentation includes effective use of electronic media, along with at least two other visual aids (e.g., charts, handouts), and participation by most group members. (l5 points)	Presentation includes limited use of electronic media, along with at least one other visual aid (e.g., charts, handouts), and participation by some group members. (10 points)	Presentation includes very limited use of electronic media, along with at least one or no other visual aids (e.g., charts, handouts), and participation by few or no group members. (5 points)
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals. (20 points)	Student effectively demonstrates leadership in organizing group work and structuring individual work. Student takes a leadership role in presentation. (20 points)	Student helps to organize group work and structure individual work. Student takes an active role in presentation. (15 points)	Student participates in group work and adequately structures individual work. (10 points)	Student does not participate in group work or structure individual work. (5 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry.

International Trade Pathway Occupations	
High school (diploma)	• Sales Representative • Shipping and Receiving Clerk • Stocking and Handling Worker
Postsecondary training (certification and/or AA degree)	• Warehouse Manager • Route Salesperson
College or university (bachelor's degree or higher)	• Economist • International Distribution Manager • International Trade Specialist • Marketing Research Analyst • Wholesale Distribution Manager

Professional Sales and Marketing

Sample sequence of courses in the Professional Sales and Marketing pathway:

CTE courses	Related courses
Introductory • Financial Literacy • Keyboarding • Computer Applications • Business Communications • Exploratory Business • Introduction to Marketing	• Business Law • Economics • Technical Business Communications
Concentration • Accounting • Finance • Business Management • Principles of Marketing • Retail Merchandising	
Capstone • Virtual Enterprise • Entrepreneurship	

Sample of appropriate foundation and pathway standards for the Principles of Marketing course in the Professional Sales and Marketing pathway:

Foundation standards	**Academics 1.1 Number Sense (grade seven) 1.7:** Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.
	Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6: Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).

Foundation standards	**Communications 2.4 Listening and Speaking Strategies and Applications (grades nine and ten) 2.5:** Deliver persuasive arguments (including evaluation and analysis of problems and solutions and causes and effects): a. Structure ideas and arguments in a coherent, logical fashion. b. Use rhetorical devices to support assertions (e.g., by appeal to logic through reasoning; by appeal to emotion or ethical belief; by use of personal anecdote, case study, or analogy). c. Clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, expressions of commonly accepted beliefs, and logical reasoning. d. Anticipate and address the listener's concerns and counterarguments.
	Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**MSS D1.1:** Know the characteristics of a successful salesperson.
	MSS D1.2: Understand how various types of selling are applied in wholesale and retail environments.
	MSS D1.3: Know the steps of the selling process.
	MSS D1.5: Understand the impact of a salesperson's knowledge of the product and its effect on potential sales.
	MSS D1.6: Understand buying motives and the customer's decision-making process.

Sample analysis ("unpacking") of a standard for the Principles of Marketing course in the Professional Sales and Marketing pathway:

Standard	**Marketing, Sales, and Service D1.0:** Students understand the key concepts of professional sales and marketing.	
Standard subcomponent	**Marketing, Sales, and Service D1.3:** Know the steps of the selling process.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Characteristics of a successful salesperson 2. Steps and techniques involved in the selling process 3. How to identify potential customers 4. Buying motives and decision-making processes of potential customers 5. Ethics in sales and marketing	*Benchmarks* 1. List basic characteristics of a successful salesperson. 2. Cite three selling techniques. 3. Cite and give two examples of potential customers. 4. Cite and give two examples of buying motives and explain one decision-making process. 5. Explain the importance of ethics and give two examples.

What should students be able to do? At what level?	*Skills* 1. Develop selling strategies. 2. Identify various selling techniques matching diverse environments. 3. Know selling techniques to increase customer satisfaction.	*Benchmarks* 1. Identify appropriate selling techniques for three possible retail or wholesale scenarios. 2. Identify appropriate selling techniques matching customer's need for four given examples. 3. Identify three selling techniques that can increase customer satisfaction.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–4 2. Interpreting data and drawing conclusions 3. Compare and contrast retail and wholesale environments 4. Appropriate communication skills to sell a particular product 5. Sales and marketing ethics	

Sample Performance Task

Standards: This sample performance task targets the following Marketing, Sales, and Service sector foundation and Professional Sales and Marketing pathway standards:

Standard number	Standards
Foundation: Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6	Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources).
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: MSS D1.3	Know the steps of the selling process.

Assignment: You and a partner are to reenact a selling and buying moment within a specific environment—retail or wholesale (MSS D1.3; Leadership and Teamwork 9.3). Draw on the information you have learned so far to complete the following steps:

1. Work with your partner to:
   a. Determine who is the seller and who is the buyer.
   b. Determine the environment—retail or wholesale.
   c. Determine the product to be sold or purchased.
   d. Identify and practice appropriate selling techniques to increase customer wants and satisfaction.
   e. Practice the buying motives and decision-making process of the potential buyer.
   f. Practice appropriate selling technique when the customer is uninterested.
2. Present to the class a one- to two-minute reenactment of the predetermined scenario decided by each two-member team (Communications 2.2 Writing Strategies and Applications [grades eleven and twelve] 1.6).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
MSS D1.3: Know the steps of the selling process. (20 points)	The presentation reflects knowledge of selling process, ethical selling techniques, retail and wholesale environment, and product. The presentation is creative and well phrased, nonduplicative, thorough, and comprehensive. (20 points)	The presentation reflects knowledge of selling process, ethical selling techniques, retail and wholesale environment, and product. The presentation is well phrased, nonduplicative, and fairly comprehensive. (15 points)	The presentation reflects knowledge of selling process and ethical selling techniques. The presentation is lacking in understanding of how to address customer needs and satisfaction, is no more than somewhat duplicative, and has limited details. (10 points)	The presentation reflects ineffective use of previously covered text information, is poorly phrased, has few details, and lacks cohesiveness. (5 points)
Communications 2.2 Writing Strategies and Applications (grades eleven and twelve) 1.6: Develop presentations by using clear research questions and creative and critical research strategies (e.g., field studies, oral histories, interviews, experiments, electronic sources). (60 points)	The presentation includes all assigned steps for the lesson, is creative and engaging, correctly uses language, and shows an understanding of key concepts of professional sales and marketing. (60 points)	The presentation includes all assigned steps for the lesson, is somewhat creative and engaging, correctly uses language, and shows some understanding of key concepts of professional sales and marketing. (40 points)	The presentation does not include all assigned steps for the lesson, lacks creativity, but shows some understanding of key concepts of professional sales and marketing. (20 points)	The presentation does not include all assigned steps for the lesson and illustrates a lack of understanding of key concepts of professional sales and marketing. (10 points)
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals. (20 points)	Student effectively demonstrates leadership in organizing team's assignment and structuring individual work. (20 points)	Student helps to organize team's assignment and structures individual work. (15 points)	Student participates in group work and adequately structures individual work. (10 points)	Student does not participate in group work. Individual work is partially complete, indicating limited time and organization skills. (5 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Professional Sales and Marketing Pathway Occupations	
High school (diploma)	• Customer Service Representative • Small Business Entrepreneur • Telemarketer
Postsecondary training (certification and/or AA degree)	• Franchisee • Marketing Manager • Regional Sales Manager • Retail/Wholesale Buyer
College or university (bachelor's degree or higher)	• Chief Executive Officer • National Account Manager • Account Executive • Business Teacher*

Notes

1. California Employment Development Department, *California Industry Employment Projections 2004–2014,* March 2005. http://www.labormarketinfo.edd.ca.gov/cgi/databrowsing/?PageID=145
2. Bureau of Labor Statistics, *Occupation Outlook Handbook* (2006–07 edition). Washington, D.C.: U.S. Department of Labor, 2006.

Public Services Industry Sector

The U.S. Bureau of Labor Statistics projects increases in employment nationwide through 2014 for all three pathways in the Public Services industry sector. Job openings in community and social services are expected to increase by approximately 21 percent; in legal services, by 16 percent, in protective services, by 14 percent;[1] and in state and local government services, by 11 percent.[2] In California occupational employment projections also foresee growth in all of this sector's pathways through 2014. Job openings in state and local government services are expected to increase by 17 percent;[3] in community and social services, by 22 percent; in legal services, by 16 percent; and in protective services, by 18 percent.[4] This growth will result from heightened interest in homeland and border security as well as the retirement of workers from the baby-boom generation.

The Public Services industry sector provides a foundation for secondary students in government, public administration, public safety, legal services, and human services. It encompasses three career pathways, Human Services, Legal and Government Services, and Protective Services, which emphasize processes, systems, and services related to serving the public's interest. Knowledge and skills are acquired (1) within a sequential, standards-based program that integrates classroom, laboratory, and project- and work-based instruction; and (2) through internships, community classrooms, work experience, and cooperative career technical education. Pathways in this sector are designed to prepare students for technical training, postsecondary education, and entry to a variety of careers.

Public Services Industry Sector Pathways:

- Human Services
- Legal and Government Services
- Protective Services

Human Services

Sample sequence of courses in the Human Services pathway:

CTE courses	Related courses
Introductory • Introduction to Human Services • Conflict Resolution	• U.S. History • English • Biology • Algebra
Concentration • Principles of Recovery and Psychosocial Rehabilitation • Recovery and Special Populations	
Capstone • Helping Relationships • Psychosocial Rehabilitation Worker Field Experience	

Sample of appropriate foundation and pathway standards for the Psychosocial Rehabilitation Worker Field Experience course in the Human Services pathway:

Foundation standards

Academics 1.1 Algebra I (grades eight through twelve) 15.0: Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.

Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.

Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.d: Formulate explanations by using logic and evidence.

Academics 1.3 United States History and Geography (grade eleven) 11.10.2: Examine and analyze the key events, policy, and court cases in the evolution of civil rights, including *Dred Scott* v. *Sandford, Plessy* v. *Ferguson, Brown* v. *Board of Education, Regents of the University of California* v. *Bakke*, and California Proposition 209.

Communications 2.3 Written and Oral English Language Conventions (grades eleven and twelve) 1.1: Demonstrate control of grammar, diction, and paragraph and sentence structure and an understanding of English usage.

Career Planning and Management 3.4: Understand the role and function of professional organizations, industry associations, and organized labor in a productive society.

Technology 4.5: Use technologies to analyze and interpret information.

Responsibility and Flexibility 7.1: Understand the qualities and behaviors that constitute a positive and professional work demeanor.

Responsibility and Flexibility 7.2: Understand the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.

Ethics and Legal Responsibilities 8.3: Understand the role of personal integrity and ethical behavior in the workplace.

Leadership and Teamwork 9.1: Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community and workplace settings.

Foundation standards	**Leadership and Teamwork 9.3:** Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
	Leadership and Teamwork 9.5: Understand how to interact with others in ways that demonstrate respect for individual and cultural differences and for the attitudes and feelings of others.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**PS A1.0:** Students understand the history of human services in America and the role of and demand for human service professionals.
	PS A2.0: Students understand the basic attitudes and skills needed to be a successful human service worker, including linking problem-solving methods to desired outcomes.
	PS A3.0: Students develop the specific, effective communication skills essential for working in the human services field.
	PS A4.0: Students understand various common cultures and the importance of providing culturally competent human services.
	PS A5.0: Students know the basic principles of research, gathering data, entering the data, and interpreting the results.
	PS A6.0: Students understand various leadership styles and accountability in human services.
	PS A7.0: Students understand the basic elements of administration of a human services agency, including recordkeeping and fundraising.

Sample analysis ("unpacking") of a standard for the Psychosocial Rehabilitation Worker Field Experience course in the Human Services pathway:

Standard	**Public Services A7.0:** Students understand the basic elements of administration of a human services agency, including recordkeeping and fundraising.	
Standard subcomponent	**Public Services A7.3:** Understand the key aspects of administration, evaluation, reporting, and maintenance of records in a human services agency.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Elements of successful human services agencies 2. Definition and purpose of a *needs assessment* 3. Definition and purpose of *mission and vision statements* 4. Definition and purpose of *program and operations evaluation* 5. Key functions of administration 6. Key aspects of recordkeeping and reporting	*Benchmarks* 1. Name eight basic elements. 2. Cite basic definition and two purposes. 3. Cite basic definition and purpose of each. 4. Cite basic definition and two purposes of each. 5. Name six basic roles of administration. 6. Cite three purposes of recordkeeping and reporting and key components of each.

	Skills	*Benchmarks*
What should students be able to do? At what level?	1. How to create and conduct a needs assessment of a community 2. How to write mission and vision statements 3. How to analyze elements of an evaluation	1. Carry out a needs assessment for a community, using a small sample. 2. Create relevant, concrete, and challenging performance-driven guiding principles. 3. Use key findings to support program services.
Topics and contexts **What must be taught?**	1. Basic knowledge of psychosocial rehabilitation principles 2. Creating research questions for a needs assessment that will be used as a tool for collecting raw data 3. Setting performance goals that support the proposed nonprofit community center	

Sample Performance Task

Standards: This sample performance task targets the following Public Services sector foundation and Human Services pathway standards:

Standard number	Standards
Foundation: Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a	Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.
Foundation: Communications 2.3 Written and Oral English Language Conventions (grades eleven and twelve) 1.1	Demonstrate control of grammar, diction, and paragraph and sentence structure and an understanding of English usage.
Foundation: Leadership and Teamwork 9.5	Understand how to interact with others in ways that demonstrate respect for individual and cultural differences and for the attitudes and feelings of others.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards
Pathway: PS A7.3	Understand the key aspects of administration, evaluation, reporting, and maintenance of records in a human services agency.

Assignment: In creating a nonprofit community center proposal, you will first take a field trip to visit a nonprofit human services agency, where you will be offered a presentation and tour of the facility and be allowed to ask questions about its operation. Your assignment is to:

1. Work in groups of four (Leadership and Teamwork 9.5) to:
   a. Create a concise, well-written mission statement and a vision statement. Both statements must be no more than two to three sentences in length and contain no errors in spelling or grammar (PS A7.3; Communications 2.3 Written and Oral English Language Conventions [grades eleven and twelve] 1.1).
   b. Brainstorm as a group and prepare five to ten questions for an assessment to be conducted in your community to determine the need for human services (PS A7.3; Academics 1.2 Investigation and Experimentation 1.a).

   c. Analyze the results (PS A7.3; Academics 1.2 Investigation and Experimentation 1.a) by:
      (1) Indicating the community's greatest human service needs
      (2) Determining the three to five major problems that led to the needs
      (3) Reaching consensus on what the programs or solutions for the needs should be
      (4) Determining the cost for implementing programs or solutions
      (5) Using the data to make viable recommendations
2. Prepare a 50-word abstract that reflects a gap analysis, solutions for your community, together with concrete, clear and current recommendations, and ideas for potential financial donors (PS A7.3; Communications 2.3 Written and Oral English Language Conventions [grades eleven and twelve] 1.1).
3. Create a four- to five-minute PowerPoint presentation in which you explain (PS A7.3) the following:
   a. How you came up with the name of the community center
   b. How you designed and conducted the needs assessment
   c. How the results of the needs assessment link to the rationale for a community center
   d. What geographic area your community center will serve and why
   e. What specific training or qualifications are required for center employees
   f. How programs and services will be funded
   g. How the program will be evaluated to ensure accountability and effectiveness

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
PS A7.3: Understand the key aspects of administration, evaluation, reporting, and maintenance of records in a human services agency. (50 points)	Rationale for the community center is directly linked to data from needs assessment, with strong supporting evidence. Social issue is relevant, and agency design is data driven and shows extensive consideration of community needs and agency operations. (50 points)	Rationale for the community center is supported by needs assessment and deals with a well-described issue. Agency design and recommendations are solid, with some oversights, and are in keeping with community needs. (30 points)	Rationale for the community center is minimally supported by needs assessment and briefly mentions the connection between agency programs and community needs. Agency design has significant problems or omissions but addresses other areas well. (20 points)	Rationale for the community center is not supported by needs assessment. Agency design and recommendations are not substantiated. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data. (20 points)	Needs assessment questions are in a variety of formats (for example, multiple choice, true/false, check all, Likert scale), and each format is chosen to elicit the maximum useful data on the question's topic. The step-by-step methodology for collecting and analyzing relevant data is detailed and accurate. The analysis is in-depth, making use of advanced data analysis techniques. Key findings are reported in informative, useful, and clear graphs, charts, and tables as well as in text form. (20 points)	Needs assessment questions are in at least two formats (for example, multiple choice, true/false, check all, Likert scale), and each format is chosen to elicit useful data on the question's topic. The methodology for collecting and analyzing relevant data is accurate. The analysis makes use of basic data analysis techniques. Key findings are reported in informative and clear graphs, charts, and tables or highlighted in the text. (10 points)	Needs assessment questions are all in one format or in a variety of formats that will elicit minimally useful data on the question's subject. The methodology for collecting and analyzing the data is missing key steps or is inaccurate. The analysis makes use of only minimal data analysis techniques (means, medians, and percentages). Key findings are presented in ordinary text form and are difficult to identify in the document. Graphs are not present or not useful. (2 points)	Needs assessment questions are unlikely to elicit useful data. The methodology for collecting and analyzing the data is entirely absent, vaguely described, or likely to introduce data errors. The analysis does not contain any key findings or contains key findings that cannot be drawn from the data obtained. Graphs are absent, confusing, or misleading. (0 points)
Communications 2.3 Written and Oral English Language Conventions (grades eleven and twelve) 1.1: Demonstrate control of grammar, diction, and paragraph and sentence structure and an understanding of English usage. (20 points)	Needs assessment questions are consistent with the topic and designed to elicit useful responses. The questions are well written for an eighth-grade reading level. The needs assessment is clear and concise and contains no grammatical or spelling errors. (20 points)	Needs assessment questions are consistent with the topic. The needs assessment is concise and easy to understand and contains few (one per page) grammatical or spelling errors. (10 points)	Most needs assessment questions are linked to the topic. The needs assessment is clear and contains several (two per page) grammatical or spelling errors. (2 points)	Needs assessment questions lack relevance to topic, are difficult to understand, or are duplicated. Or there are many grammatical or spelling errors (more than three per page) in the needs assessment. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Leadership and Teamwork 9.5: Understand how to interact with others in ways that demonstrate respect for individual and cultural differences and for the attitudes and feelings of others. (10 points)	Teacher observes student taking leadership in organizing the group and coaching students on their assignments. (10 points)	Teacher observes student dividing assignments evenly among the team members and structuring individual work effectively. (8 points)	Teacher observes student delegating assignments to other students and inadequately structuring individual work. (6 points)	Teacher observes student not engaging in group or individual work. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Human Services Pathway Occupations	
High school (diploma)	• Youth Worker • Child Care Aide • Mental Health Aide • Foster Care Worker • Case Manager Aide
Postsecondary training (certification and/or AA degree)	• Residential Counselor* • Social Service Coordinator* • Substance Abuse Counselor* • Licensed Psychiatric Technician* • Mental Health Worker*
College or university (bachelor's degree or higher)	• Licensed Clinical Social Worker* • Marriage and Family Therapist* • Mental Health Rehabilitation Specialist * • Family Social Service Worker

Legal and Government Services

Sample sequences of courses in the Legal and Government Services pathway:

CTE courses	Related courses
Introductory • Constitutional Law A and B	• Forensic Science • English • World History • U.S. History • Government/Economics
Concentration • Criminal Justice/Policies and Procedures	
Capstone • Criminal Law/International Law	

Sample of appropriate foundation and pathway standards for the Constitutional Law course in the Legal and Government Services pathway:

Foundation standards

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.4: Write persuasive compositions:

a. Structure ideas and arguments in a sustained and logical fashion.
b. Use specific rhetorical devices to support assertions (e.g., appeal to logic through reasoning; appeal to emotion or ethical belief; relate a personal anecdote, case study, or analogy)
c. Clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, and expressions of commonly accepted beliefs and logical reasoning.
d. Address readers' concerns, counterclaims, biases, and expectations.

Communications 2.4 Speaking Applications (grades nine and ten) 2.5: Deliver persuasive arguments (including evaluation and analysis of problems and solutions and causes and effects):

a. Structure ideas and arguments in a coherent, logical fashion.
b. Use rhetorical devices to support assertions (e.g., by appeal to logic through reasoning; by appeal to emotion or ethical belief; by use of personal anecdote, case study, or analogy).
c. Clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, expressions of commonly accepted beliefs, and logical reasoning.
d. Anticipate and address the listener's concerns and counterarguments.

Problem Solving and Critical Thinking 5.0: Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques.

Problem Solving and Critical Thinking 5.1: Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.

Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.

Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards	**PS B1.0:** Students develop and articulate reasoned, persuasive arguments in support of public policy options or positions.
	PS B9.0: Students understand the foundation of national and state law and the important elements of trial procedure.
	PS B9.1: Know the key elements of the U.S. Constitution and Bill of Rights; and know the basic parameters of U.S. and international military, maritime, criminal, and civil law.
	PS B9.2: Know the basic elements of all aspects of trial procedures.

Sample analysis ("unpacking") of a standard for the Constitutional Law course in the Legal and Government Services pathway:

Standard	**Public Services B9.0:** Students understand the foundation of national and state law and the important elements of trial procedure.	
Standard subcomponent	**Public Services B9.2:** Know the basic elements of all aspects of trial procedures.	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Understand the U.S. advocacy system. 2. Understand pretrial motions. 3. Understand the roles of both prosecution and defense attorneys. 4. Know the rules of evidence in a trial. 5. Understand the role of the judge in seeing the basic principles of justice maintained. 6. Understand use of effective opening and closing arguments. 7. Know the strategies of direct questions in a trial. 8. Know the role of cross-examination in trial strategies. 9. Know the strategies of redirect examination.	*Benchmarks* 1. Give a basic definition of the *advocacy system.* 2. Cite examples of basic pretrial motions and explain when each is best used. 3. Articulate five basic differences and similarities between prosecution and defense. 4. Cite examples of seven most commonly used objections. 5. Give a basic explanation of the judge's role. 6. Cite examples of effective opening and closing arguments from historically significant cases. 7. Cite examples of effective lines of direct questioning from historically significant cases. 8. Cite examples of effective cross-examinations from historically significant cases. 9. Give a basic definition of *redirect examination* and cite examples of effective usage.

	Skills	*Benchmarks*
What should students be able to do? At what level?	1. How to respond at a pretrial hearing at which pretrial motions are presented 2. How to assume the role of attorney 3. How to raise objections during a trial 4. How to assume the role of judge in a trial 5. How to write effective opening and closing arguments 6. How to effectively develop and write a line of direct examination questions 7. How to strategically cross-examine a witness to nullify direct testimony	1. Present pretrial motions at a mock pretrial hearing. 2. Assume the role of either prosecuting or defense attorney at a mock trial. 3. Raise *appropriate* objections when assuming an attorney role in a mock trial. 4. Assume the role of presiding judge in a mock trial. 5. Write an effective opening and closing argument for a mock trial. 6. Articulate a desired outcome and develop a line of direct questioning for a hypothetical witness. 7. Develop an effective cross-examination.
Topics and contexts **What must be taught?**	1. Basic knowledge of preceding concepts 1–9 2. Basics of a pretrial hearing and associated motions 3. Roles of prosecutor, defense attorney, judge 4. Writing of effective opening and closing statements 5. Writing of effective direct examination and cross-examination questions	

Sample Performance Task

Standards: This sample performance task targets the following Public Services industry sector foundation and Legal and Government Services pathway standards:

Standard number	Standards
Foundation: Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.4	Write persuasive compositions: a. Structure ideas and arguments in a sustained and logical fashion. b. Use specific rhetorical devices to support assertions (e.g. appeal to logic through reasoning; appeal to emotion or ethical belief; relate a personal anecdote, case study, or analogy). c. Clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, and expressions of commonly accepted beliefs and logical reasoning. d. Address readers' concerns, counterclaims, biases, and expectations.
Foundation: Communications 2.4 Speaking Applications (grades nine and ten) 2.5	Deliver persuasive arguments (including evaluation and analysis of problems and solutions and causes and effects): a. Structure ideas and arguments in a coherent, logical fashion. b. Use rhetorical devices to support assertions (e.g., by appeal to logic through reasoning; by appeal to emotion or ethical belief; by use of personal anecdote, case study, or analogy). c. Clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, expressions of commonly accepted beliefs, and logical reasoning. d. Anticipate and address the listener's concerns and counterarguments.

Standard number	Standards
Foundation: Problem Solving and Critical Thinking 5.1	Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: PS B9.2	Know the basic elements of all aspects of trial procedures.

Assignment: In your cooperative learning group, you will conduct a mock trial of a criminal case, utilizing your knowledge of proper courtroom procedure and rules of evidence. The trial will illustrate your ability to formulate precise questions and present convincing arguments. Your assignment is to:

1. Work with your group as either the prosecution team or defense team to prepare for the mock trial (PS B9.2, Leadership and Teamwork 9.3) by:
   a. Gathering evidence from source documents
   b. Having those playing the role of witnesses on your team write witness statements (Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.4; Communications 2.4 Speaking Applications [grades nine and ten] 2.5)
   c. Developing lines of direct questioning for each witness (Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.4; Communications 2.4 Speaking Applications [grades nine and ten] 2.5; Problem Solving and Critical Thinking 5.1)
   d. Anticipating opposing counsel's line of direct questioning based on existing evidence and developing a strategy for cross-examination (Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.4; Communications 2.4 Speaking Applications [grades nine and ten] 2.5; Problem Solving and Critical Thinking 5.1)
   e. Writing and rehearsing the delivery of the opening and closing arguments for your case (Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.4; Communications 2.4 Speaking Applications [grades nine and ten] 2.5; Problem Solving and Critical Thinking 5.1) (Be ready to adjust your closing argument on the basis of evidence presented at trial.)
   f. Rehearsing your witnesses (Communications 2.4 Speaking Applications [grades nine and ten] 2.5).
   g. Reviewing the rules of evidence and objections
2. Conduct the mock trial (PS B9.2) (One preselected student will serve as judge and students from another class will serve as the jury.):
   a. Go through pretrial motions.
   b. Present opening arguments.
   c. Prosecution presents its case as follows:
      (1) Witness is called.
      (2) Evidence is admitted.
      (3) Opposing counsel cross-examines.
      (4) Redirect questioning is done.

d. Defense presents its case as follows:
   (1) Witness is called.
   (2) Evidence is admitted.
   (3) Opposing counsel cross-examines.
   (4) Redirect questioning is done.
e. Present closing arguments.
f. Jury deliberates.
g. Verdict is rendered.

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
PS B9.2: Know the basic elements of all aspects of trial procedures. (50 points possible)	Student demonstrates thorough knowledge of all roles in the mock trial. Student completes all requirements of his or her assigned role on time and with accuracy, is able to handle unforeseen obstacles deftly, and maintains and fulfills role throughout the process. Student demonstrates complete knowledge of all rules of evidence and trial procedure. (50 points)	Student demonstrates knowledge of his or her role and completes all tasks associated with that role. Student demonstrates adequate knowledge of rules of evidence and trial procedures but cannot recover when confronted with unforeseen obstacles. (47 points)	Student demonstrates some knowledge of his or her role but cannot work independently. Student understands enough of the rules of evidence and trial procedure to complete role but cannot respond to unforeseen obstacles and/or does not know how to respond adequately to cross-examination. (44 points)	Student plays role in the mock trial but does not understand how role fits into the development of the case, lacks understanding of rules of evidence and procedures, cannot recover when confronted with unforeseen obstacles, or has only rudimentary knowledge. Or student does not play any role in the mock trial. (40 points)
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.4: Write persuasive compositions. (10 points)	Student structures ideas and arguments in a sustained and logical fashion. The written document associated with the student's role in the mock trial uses appropriate vocabulary, tone, and style, clearly highlighting his or her central ideas. (10 points)	Student writes clearly, adequately phrasing central points. The writing maintains the tone of the assigned role and advances the case of the team. (7 points)	Student adequately communicates the information the role demands in a manner that is plagued by inconsistencies and inaccuracies, hindering the team's case. (5 points)	Student's writing is poorly structured, not presented in a logical fashion, or filled with inconsistencies. The document associated with the student's assigned role does not employ appropriate vocabulary or maintain a clear focus. (3 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Communications 2.4 Speaking Applications (grades nine and ten) 2.5: Deliver persuasive arguments (including evaluation and analysis of problems and solutions and causes and effects). (20 points)	Student delivers narrative presentations that clearly communicate their significance to the audience, support a thesis, and accurately and coherently convey information. Anticipates the listener's potential misunderstandings, biases, and expectations and addresses them during presentations. Prepares and asks relevant questions that demonstrate thorough knowledge, with excellent descriptions based on extensive concrete and sensory detail. (20 points)	Student delivers narrative presentations that communicate a clear picture to the audience and supports a thesis. Prepares and asks relevant questions demonstrating knowledge of the subject. Gives effective descriptions, using some concrete and sensory detail. (17 points)	Student narrates a sequence of events with some inconsistency. Presentations support the efforts of the team, but central points are not evident. Demonstrates a basic knowledge of the subject. Provides basic descriptions, with minimal concrete and sensory detail. (14 points)	Student does not clearly narrate a sequence of events. Presents inadequate or no evidence in support of the thesis. Questions are not relevant. Includes no sensory or concrete detail in descriptions. (10 points)
Problem Solving and Critical Thinking 5.1: Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks. (15 points)	Student uses logical reasoning, analytical thinking, and problem-solving techniques to develop the entire case. Problem solving incorporates input, process, outcome, and feedback components. Employs these critical thinking skills when presented with unforeseen obstacles that occur during direct or cross examination. (15 points)	Student helps the team solve problems. Employs logical reasoning while developing a portion of the case. Employs logical reasoning skills when confronted with unforeseen obstacles during trial. (12 points)	Student follows guidelines set forth for developing a portion of the case. End product presents the information in a logical fashion but demonstrates little or no creativity. (10 points)	Student does not demonstrate understanding of how to create alternative solutions using critical thinking. Cannot recover when confronted by unexpected obstacles. Little evidence of problem-solving strategies in work. (8 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and attainment of goals. (5 points)	Student organizes work without direction and structures work individually and in teams for effective performance. Knows multiple approaches to conflict resolution and understands how to interact with others to achieve team and individual goals. (5 points)	Student works well with others, is able to give and take direction, and helps organize the group. (4 points)	Student follows the group plan and adequately structures or plans his or her individual work. (3 points)	Student cannot follow the group work plan without assistance and cannot structure or plan his or her individual work. (2 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Legal and Government Services Pathway Occupations	
High school (diploma)	• Elected Official
Postsecondary training (certification and/or AA degree)	• Legal Clerk* • Paralegal*
College or university (bachelor's degree or higher)	• Attorney* • Diplomatic Service

Protective Services

Sample sequence of courses in the Protective Services pathway:

CTE courses	Related courses
Introductory • Police Science • Fire Science I	• Biology • Chemistry • Technical Writing • Psychology • Computer Science
Concentration • Crime Scene Investigation • Forensic Science • Fire Science II	
Capstone • Law Enforcement Internship • Fire Internship	

Sample of appropriate foundation and pathway standards for the Fire Science I course in the Protective Services pathway:

Foundation standards

Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.

Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.l: Analyze situations and solve problems that require combining and applying concepts from more than one area of science.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.3: Write expository compositions, including analytical essays and research reports:

a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives.
b. Convey information and ideas from primary and secondary sources accurately and coherently.
c. Make distinctions between the relative value and significance of specific data, facts, and ideas.
d. Include visual aids by employing appropriate technology to organize and record information on charts, maps, and graphs.
e. Anticipate and address readers' potential misunderstandings, biases, and expectations.
f. Use technical terms and notations accurately.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents (e.g. a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting):

a. Report information and convey ideas logically and correctly.
b. Offer detailed and accurate specifications.
c. Include scenarios, definitions, and examples to aid comprehension (e.g., troubleshooting guide).
d. Anticipate readers' problems, mistakes, and misunderstandings.

Communications 2.4 Speaking Applications (grades nine and ten) 2.1: Deliver narrative presentations:

a. Narrate a sequence of events and communicate their significance to the audience.

Foundation standards	b. Locate scenes and incidents in specific places. c. Describe with concrete sensory details the sights, sounds, and smells of a scene and the specific actions, movements, gestures, and feelings of characters. d. Pace the presentations of actions to accommodate time and mood changes.
	Technology 4.5: Use technologies to analyze and interpret information.
	Problem Solving and Critical Thinking 5.1: Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
	Problem Solving and Critical Thinking 5.3: Use critical thinking skills to make informed decisions and solve problems.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**PS C1.2:** Develop and maintain a constant awareness of potential problems.
	PS C1.6: Apply critical thinking skills to perform in emergency response situations.
	PS C3.0: Students understand the safety, health, and environmental responsibilities of those in the protective services pathway.
	PS C3.1: Become certified in first aid and cardiopulmonary resuscitation (CPR) in order to apply those skills as needed in emergencies.
	PS C7.2: Understand how to use clear, concise, and legible entries from experience and observation to prepare and submit required reports.
	PS C9.1: Understand the skills required to deal effectively with emergency situations.

Sample analysis ("unpacking") of a standard for the Fire Science I course in the Protective Services pathway:

Standard	Public Services C3.0: Students understand the safety, health, and environmental responsibilities of those in the protective services pathway.	
Standard subcomponent	Public Services C3.1: Become certified in first aid and cardiopulmonary resuscitation (CPR) in order to apply those skills as needed in emergencies.	
Course level	☒ **Introductory** ❑ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. The ABCs of CPR 2. Mechanics of blood circulation 3. Mechanics of air exchange 4. Rates for rescue breathing and heart compressions	*Benchmarks* 1. Give basic definition of *the ABCs of CPR.* 2. Describe the circulatory system and correctly label a diagram. 3. Describe three key elements of air exchange. 4. Cite correct compression and breathing rates for one-person and two-person CPR.
What should students be able to do? At what level?	*Skills* 1. How to open a person's airway 2. How to perform rescue breathing 3. How to perform heart compressions 4. How to perform one- and two-person CPR	*Benchmarks* All items: Demonstrate skill on a model or volunteer with 100 percent accuracy within a given period of time.

Topics and contexts **What must be taught?**	1. The ABCs of CPR 2. The mechanics of blood circulation and air exchange 3. The procedure for opening an airway 4. The procedure for rescue breathing 5. The procedure for heart compressions 6. One- and two-person CPR

Sample Performance Task

Standards: This sample performance task targets the following Public Services sector foundation and Protective Services pathway standards:

Standard number	Standards
Foundation: Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a	Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.
Foundation: Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.l	Analyze situations and solve problems that require concepts from more than one area of science.
Foundation: Technology 4.5	Use technologies to analyze and interpret information.
Foundation: Problem Solving and Critical Thinking 5.1	Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: PS C3.1	Become certified in first aid and cardiopulmonary resuscitation (CPR) in order to apply those skills as needed in emergencies.

Assignment: You and a friend are leaving a restaurant. As you walk out the front door, the gentleman in front of you grabs his chest and collapses. Your laboratory group will:

1. Develop a ten-minute presentation that demonstrates the step-by-step procedure you will use to initiate and perform CPR (PS C3.1; Academics 1.2 Investigation and Experimentation [grades nine through twelve] 1.a; Technology 4.5; Problem Solving and Critical Thinking 5.1; Demonstration and Application 11.0).
2. Write a description explaining how the following situations might cause you to alter your CPR procedures (PS C3.1; Academics 1.2 Investigation and Experimentation [grades nine through twelve] 1.a; Academics 1.2 Investigation and Experimentation [grades nine through twelve] 1.l; Technology 4.5; Problem Solving and Critical Thinking 5.1; Demonstration and Application 11.0):
   a. Victim has blocked airway.
   b. Restaurant has an automated external defibrillator (AED) available.
3. Complete correctly a "run sheet" for this event (Academics 1.2 Investigation and Experimentation [grades nine through twelve] 1.l; Demonstration and Application 11.0).

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
PS C3.1: Become certified in first aid and cardiopulmonary resuscitation (CPR) in order to apply those skills as needed in emergencies. (70 points)	Student passes written and practical exams with grades of 95 percent or better. CPR certification is received. (70 points)	Student passes written and practical exams. CPR certification is received. (55 points)	Student passes either written or practical exam but not both. Does not receive CPR certification. (40 points)	Student fails both written and practical exams. Does not receive CPR certification. Or student does not take exams. (0 points)
Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.a: Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data. (6 points)	Equipment (e.g., AED, bag mask, airway) is properly selected and properly used in professional-standard time. (6 points)	Equipment (e.g., AED, bag mask, airway) is properly selected and properly used. (5 points)	Equipment (e.g., AED, bag mask, airway) is properly selected but not properly used. (3 points)	Equipment (e.g., AED, bag mask, airway) is neither properly selected nor properly used. (0 points)
Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.l: Analyze situations and solve problems that require concepts from more than one area of science. (6 points)	Student analyzes scenario accurately and rapidly and responds appropriately. All behaviors meet the standard of a working professional in the field. (6 points)	Student analyzes scenario accurately and responds appropriately. (5 points)	Student analyzes scenario accurately but does not respond appropriately. (3 points)	Student does not analyze scenario properly and thus cannot respond appropriately. (0 points)
Technology 4.5: Use technologies to analyze and interpret information. (6 points)	AED is properly used to analyze and interpret cardiac data in professional time. (6 points)	AED is properly used to analyze and interpret cardiac data. (5 points)	AED is properly used to analyze but not to interpret cardiac data. (3 points)	AED is not properly used to analyze or interpret cardiac data. (0 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Problem Solving and Critical Thinking **5.1:** Apply appropriate problem-solving strategies and critical thinking skills to work-related issues and tasks.	Relevant and creative problem-solving strategies and critical thinking skills were consistently applied to work-related tasks. (6 points)	Proper problem-solving strategies and critical thinking skills were applied to work-related tasks. (5 points)	Problem-solving strategies and critical thinking skills were applied, although not properly or consistently, to work-related tasks. (3 points)	No problem-solving strategies or critical thinking skills were noted. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Protective Services Pathway Occupations	
High school (diploma)	• Security Guard* • Emergency Medical Technician* • Animal Control Officer* • Parking Enforcement Officer* • Armed Forces Police Officer
Postsecondary training (certification and/or AA degree)	• Police Officer* • Firefighter* • Paramedic* • Crime Scene Technician* • Corrections Officer* • U.S. Customs Officer* • Criminal Investigator* • Private Investigator*
College or university (bachelor's degree or higher)	• Federal Marshal* • FBI Agent* • ATF Agent* • DEA Agent* • Police Lieutenant/Captain/Chief* • Fire Captain/Chief*

Notes

1. Office of Occupational Statistics and Employment Projections, Bureau of Labor Statistics, *Employment by Major Occupational Group, 2004 and Projected 2014.* Washington, D.C.: U.S. Department of Labor, 2005. http://www.bls.gov/news.release/ecopro.t02.htm
2. Office of Occupational Statistics and Employment Projections, Bureau of Labor Statistics, *Employment by Major Industry Division, 1994, 2004, and Projected 2014.* Washington, D.C.: U.S. Department of Labor, 2005. http://www.bls.gov/news.release/ecopro.t01.htm
3. California Employment Development Department, *California Industry Employment Projections 2004–2014,* 2005. http://www.labormarketinfo.edd.ca.gov/cgi/databrowsing/?PageID=145
4. See note 3 above.

Transportation Industry Sector

Transportation plays a crucial role in our society because moving people and goods is central to everything America does. As the Transportation industry sector continues to expand significantly, it will provide employment opportunities for years to come in a vast range of transportation-related occupations. It will also continue to adapt to changing technology and repair techniques as vehicle components and systems become increasingly sophisticated. Examples include developments in rocket technology, super-capacity jet airplanes, hybrid and hydrogen fuel-cell technology affecting automobiles, and diesel trucks that run on biodiesel or other alternative fuels. This industry also plays an important part in education through financial and in-kind support for training and educating the current and future workforce.

The Transportation industry sector features three career pathways that provide opportunities from entry-level jobs requiring high school diplomas to progressive careers requiring advanced degrees. These pathways emphasize real-world, occupationally relevant experiences of significant scope and depth in Aviation and Aerospace Transportation Services, which includes maintaining aircraft, operating airports, and designing and flying various types of aircraft; Collision Repair and Refinishing, which includes painting, repairing, and refinishing vehicles; and Vehicle Maintenance, Service, and Repair, which includes maintaining, servicing, and repairing light-, medium-, and heavy-duty vehicles.

Transportation Industry Sector Pathways:

- Aviation and Aerospace Transportation Services
- Collision Repair and Refinishing
- Vehicle Maintenance, Service, and Repair

Aviation and Aerospace Transportation Services

Sample sequence of courses in the Aviation and Aerospace Transportation Services pathway:

CTE courses	Related courses
Introductory • Small Engines • Exploring Technology • Technology Core • Basic Automotive	• Digital Electronics • Algebra • English Composition/Writing • Chemistry • Computer Technology
Concentration • Electronics • Auto I	
Capstone • Avionics • Radio Communications • Aviation Aircraft Engines	

Sample of appropriate foundation and pathway standards for the Avionics course in the Aviation and Aerospace Transportation Services pathway:

Foundation standards

Academics 1.1 Mathematical Reasoning (grade seven) 2.8: Make precise calculations and check the validity of the results from the context of the problem.

Academics 1.2 Physics (grades nine through twelve) 5.b: Students know how to solve problems involving Ohm's law.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting):

a. Report information and convey ideas logically and correctly.
b. Offer detailed and accurate specifications.
c. Include scenarios, definitions, and examples to aid comprehension (e.g., trouble-shooting guide).
d. Anticipate readers' problems, mistakes, and misunderstandings.

Communications 2.3 Written and Oral English Language Conventions (grades nine and ten) 1.4: Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.

Technology 4.4: Understand the role and function of tools, equipment, and machines in the latest technology.

Health and Safety 6.1: Know the policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities.

Health and Safety 6.3: Use tools and machines safely and appropriately.

Leadership and Teamwork 9.2: Understand the ways in which preprofessional associations, such as SkillsUSA, and competitive career development activities enhance academic skills, promote career choices, and contribute to employability.

Demonstration and Application 11.0: Students demonstrate and apply the concepts in the foundation and pathway standards.

Pathway standards	**TRANS A1.0:** Students understand the value and necessity of practicing personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards.
	TRANS A2.0: Students understand the safe and appropriate use of tools and equipment common to the aviation and aerospace industries.
	TRANS A3.0: Students understand and apply measurement systems and the mathematical functions necessary to perform required maintenance and operation procedures.
	TRANS A3.1: Understand industry-standard measurement scales, devices, and systems used to perform design, fabrication, diagnostic, maintenance, and repair procedures.

Sample analysis ("unpacking") of a standard for the Avionics course in the Aviation and Aerospace Transportation Services pathway:

Standard	**Transportation A3.0:** Students understand and apply measurement systems and the mathematical functions necessary to perform required maintenance and repair procedures.	
Standard subcomponent	**Transportation A3.1:** Understand industry-standard measurement scales, devices, and systems used to perform design, fabrication, diagnostic, maintenance, and operation procedures.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. How to select technology needed to perform tasks 2. How to acquire and evaluate information 3. How to participate as a member of a team 4. How to interpret and communicate information 5. Shock hazards when servicing power supplies in electronic equipment	*Benchmarks* 1. Choose proper tools and equipment for a given task. 2. Give two examples of how to acquire and evaluate information from FAA regulations. 3. Give two objectives of the importance of participation as a team member. 4. Give two examples of the importance of being able to interpret and communicate information from FAA regulations (written and/or oral). 5. Explain accurately the source, avoidance, and treatment of shock hazards when servicing power supplies in electronic equipment.
What should students be able to do? At what level?	*Skills* 1. Determine the relationship of voltage, current, and resistance in electrical circuits. 2. Read and interpret aircraft electrical circuit diagrams. 3. Inspect and service batteries.	*Benchmarks* 1. Use volt/ohm meter to measure voltage, current, and resistance in electrical circuits and explain the relationship between them. 2. Read and interpret accurately complex aircraft electrical circuit diagrams to diagnose problems. 3. Inspect and service batteries accurately, correctly, and safely, using all applicable safety procedures and equipment.

Topics and contexts **What must be taught?**	1. Electrical theory 2. Basic electricity 3. Electronic components 4. Proper and safe use of tools and equipment

Sample Performance Task

Standards: This sample performance task targets the following Transportation industry sector foundation and Aviation and Aerospace Transportation Services pathway standards:

Standard number	Standards
Foundation: Academics 1.1 Mathematical Reasoning (grade seven) 2.8	Make precise calculations and check the validity of the results from the context of the problem.
Foundation: Academics 1.2 Physics (grades nine through twelve) 5.b	Students know how to solve problems involving Ohm's law.
Foundation: Communications 2.3 Written and Oral English Language Conventions (grades nine and ten) 1.4	Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
Foundation: Health and Safety 6.3	Use tools and machines safely and appropriately.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: TRANS A3.1	Understand industry-standard measurement scales, devices, and systems used to perform design, fabrication, diagnostic, maintenance, and repair procedures.

Assignment: In this assignment you will learn to perform basic electrical procedures consistent with safety standards (Health and Safety 6.5). In teams (Leadership and Teamwork 9.3) you will:

1. Calculate and measure capacitance and inductance (TRANS A3.1; Academics 1.1 Mathematical Reasoning [grade seven] 2.8).
2. Calculate and measure electrical power (TRANS A3.1; Academics 1.1 Mathematical Reasoning [grade seven] 2.8).
3. Measure voltage, current, resistance, and continuity (TRANS A3.1; Academics 1.2 Physics [grades nine through twelve] 5.b).
4. Determine the relationship of voltage, current, and resistance in electrical circuits (Academics 1.2 Physics [grades nine through twelve] 5.b).
5. Read and interpret electrical circuit diagrams in aircraft, including solid-state devices and logic functions (TRANS A3.1).
6. Write a report in which you explain your procedure and results, including a discussion of how they relate to Ohm's law, and discuss the safety measures you observed (Academics 1.2 Physics [grades nine through twelve] 5.b; Communications 2.3 Written and Oral English Language Conventions [grades nine and ten] 1.4; Health and Safety 6.5).

Performance Task Rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
TRANS A3.1: Understand industry-standard measurement scales, devices, and systems used to perform design, fabrication, diagnostic, maintenance, and repair procedures. (50 points)	Student properly selects and uses correct tools and measuring devices and scales in accordance with FAA and manufacturer regulations. Written report demonstrates complete understanding of purpose, operation, and function of all tools used in the assignment. (50 points)	Student properly uses correct tools and measuring devices in accordance with FAA and manufacturer regulations. Written report demonstrates general understanding of the purpose, operation, and function of all or nearly all tools used in the assignment. (40 points)	Student uses tools and measuring devices with assistance in selection and operation. Written report demonstrates limited understanding of purpose, operation, and function of the tools used in the assignment. (30 points)	Student is unable to use tools and measuring devices in accordance with FAA and manufacturer regulations. Written report indicates no understanding of purpose, operation, and function of tools used in the assignment. (20 points)
Academics 1.1 Mathematical Reasoning (grade seven) 2.8: Make precise calculations and check the validity of the results from the context of the problem. (10 points)	Student correctly and accurately measures voltage, current resistance, and conductivity in first attempt. (10 points)	Student correctly and accurately measures voltage, current resistance, and conductivity in two attempts. (8 points)	Student correctly and accurately measures voltage, current resistance, and conductivity with some assistance. (7 points)	Student correctly and accurately measures voltage, current resistance, and conductivity under direct supervision and with substantial assistance. (6 points)
Academics 1.2 Physics (grades nine through twelve) 5.b: Students know how to solve problems involving Ohm's law. (10 points)	Student accurately determines unknown variable in voltage triangle, using Ohm's law, and compares calculated results with actual measurements and evaluates them. (10 points)	Student accurately determines unknown variable in voltage triangle, using Ohm's law, or compares calculated results with actual measurements and evaluates them. (8 points)	Student accurately determines unknown variable in voltage triangle, using Ohm's law, or compares calculated results with actual measurements with limited assistance and evaluates them. (7 points)	Student is unable to calculate and/or identify accurately and measure variables or requires extensive assistance or direct supervision. (6 points)

Standards	Advanced	Proficient	Basic	Unacceptable
Communications 2.3 Written and Oral English Language Conventions (grades nine and ten) 1.4: Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization. (10 points)	Written report is clearly phrased and technically correct and contains no errors. Written report completely, accurately, and thoroughly covers procedure, results, Ohm's law, and safety measures. (10 points)	Written report is clearly phrased and technically correct and contains no more than four errors. Written report accurately and completely covers procedure, results, Ohm's law, and safety measures. (8 points)	Written report contains no more than eight errors but may be somewhat confusing. Written report lists procedure, results, Ohm's law, and safety measures but does not accurately discuss them in detail. (7 points)	Written report contains more than eight errors and/or is unclear or unreadable. Written report contains substantial omissions of procedure, results, Ohm's law, or safety measures. (6 points)
Health and Safety 6.3: Use tools, equipment, and machinery safely and appropriately. (20 points)	Student follows all safety regulations without reminders or prompting during measurement portion of task. Student correctly describes and discusses each safety regulation in written report. (20 points)	Student follows all safety regulations during measurement portion of task but may require limited reminders or prompting. Student correctly describes and discusses all or nearly all safety regulations in written report. (15 points)	Student follows all or nearly all safety regulations but requires significant reminders or prompting during measurement portion of task. Student describes most safety regulations in written report. (10 points)	Student does not follow most safety regulations despite reminders or prompting during measurement portion of task. Written report contains significant errors and omissions in discussion of safety regulations. (5 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Aviation and Aerospace Transportation Services Pathway Occupations	
High school (diploma)	• Ground Support Crew • Mechanic's Assistant • Flight Attendant • Porter • Apprentice/Intern • Aircraft Detailer
Postsecondary training (certification and/or AA degree)	• Military Ground Crew • Airframe and Power Plant Technician* • Maintenance Worker* • Ramp Service Worker* • Dispatcher
College or university (bachelor's degree or higher)	• Engineer • Astronaut* • Instructor* • Pilot*

Collision Repair and Refinishing

Sample sequence of courses in the Collision Repair and Refinishing pathway:

CTE courses	Related courses
Introductory • Introduction to Automotive Technology • Small Engines	• Electronics • English Composition • Chemistry • Welding • Algebra • Computer Technology • Physics
Concentration • Basic Collision Repair • Basic Auto Refinishing • Automotive Construction • Steering and Suspension • Auto I	
Capstone • Advanced Collision Repair Technology • Advanced Auto Refinishing	

Sample of appropriate foundation and pathway standards for the Advanced Auto Refinishing course in the Collision Repair and Refinishing pathway:

Foundation standards

Academics 1.1 Mathematical Reasoning (grade seven) 2.8: Make precise calculations and check the validity of the results from the context of the problem.

Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents (e.g., a manual on rules of behavior for conflict resolution, procedures for conducting a meeting, minutes of a meeting):

a. Report information and convey ideas logically and correctly.
b. Offer detailed and accurate specifications.
c. Include scenarios, definitions, and examples to aid comprehension (e.g., trouble-shooting guide).
d. Anticipate readers' problems, mistakes, and misunderstandings.

Communications 2.4 Listening and Speaking Strategies and Applications (grade eight) 2.4: Deliver persuasive presentations:

a. Include a well-defined thesis (i.e., one that makes a clear and knowledgeable judgment).
b. Differentiate fact from opinion and support arguments with detailed evidence, examples, and reasoning.
c. Anticipate and answer listener concerns and counterarguments effectively through the inclusion and arrangement of details, reasons, examples, and other elements.
d. Maintain a reasonable tone.

Technology 4.4: Understand the role and function of tools, equipment, and machines in the latest technology.

Health and Safety 6.1: Know the policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities.

Leadership and Teamwork 9.2: Understand the ways in which preprofessional associations, such as SkillsUSA, and competitive career development activities enhance academic skills, promote career choices and contribute to employability.

Foundation standards	**Leadership and Teamwork 9.3:** Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
	Technical Knowledge and Skills 10.6: Understand how to acquire, store and use materials and to allocate space efficiently.
	Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway standards	**TRANS B1.0:** Students understand the value and necessity of practicing personal and occupational safety and the environmental effects of collision repair and refinishing practices.
	TRANS B9.0: Students understand the concepts, principles, and practices of painting and refinishing.

Sample analysis ("unpacking") of a standard for the Advanced Auto Refinishing course in the Collision Repair and Refinishing pathway:

Standard	**Transportation B9.0:** Students understand the concepts, principles, and practices of painting and refinishing.	
Standard subcomponent	**Transportation B9.4:** Know how to mix, match, and apply paint.	
Course level	❑ **Introductory** ❑ **Concentration** ☒ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Understand different spray equipment. 2. Know how to match colors. 3. Understand spray equipment parts and their functions.	*Benchmarks* 1. Cite two different types of spray equipment and explain the selection, operation, maintenance, and use of each. 2. Explain the color wheel and its use. 3. Name the parts of a spray gun and explain the function of each part.
What should students be able to do? At what level?	*Skills* 1. How to retrieve a paint formula from a computer system 2. How to mix color from a paint formula 3. How to apply color to a vehicle	*Benchmarks* 1. Retrieve color formulas from different computer systems. 2. Mix accurately a given volume of paint color, using proper measurements. 3. Apply color to vehicle properly.
Topics and contexts **What must be taught?**	1. Knowledge of paintings systems and parts, including their functions 2. Precise measuring 3. Use of computers to retrieve formulas 4. Application of color to a vehicle 5. Proper and safe use of tools and equipment	

Sample Performance Task

Standards: This sample performance task targets the following Transportation industry sector foundation and Collision Repair and Refinishing pathway standards:

Standard number	Standards
Foundation: Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6	Write technical documents: a. Report information and convey ideas logically and correctly. b. Offer detailed and accurate specifications. c. Include scenarios, definitions and examples to aid comprehension. d. Anticipate reader's problems, mistakes, and misunderstandings.
Foundation: Communications 2.4 Listening and Speaking Strategies and Applications (grade eight) 2.4	Deliver persuasive presentations: a. Include a well-defined thesis (i.e., one that makes a clear and knowledgeable judgment). b. Differentiate fact from opinion and support arguments with detailed evidence, examples, and reasoning. c. Anticipate and answer listener concerns and counterarguments effectively through the inclusion and arrangement of details, reasons, examples, and other elements. d. Maintain a reasonable tone.
Foundation: Technology 4.4	Understand the role and function of tools, equipment, and machines in the latest technology.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
Pathway: TRANS B9.4	Know how to mix, match, and apply paint.

Assignment: A vehicle has been brought to have a panel painted. In teams (Leadership and Teamwork 9.3) you will:

1. Write a repair order for vehicle (Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.6).
2. Find a color formula on a computer and print it out (TRANS B9.4; Technology 4.4).
3. Measure, mix, and apply auto refinish to manufacturer's specifications (TRANS B9.4; Technology 4.4).
4. Write a short report (500 words minimum) explaining how to match color, using a color wheel. Include definitions of *hue, value,* and *chroma* (TRANS B9.4; Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.6).
5. Prepare and present an oral report, three to five minutes in length, including the following information (TRANS B9.4; Communications 2.4 Listening and Speaking Strategies and Applications [grade eight] 2.4):
   a. Mixing and matching paints
   b. Applying automotive paints
   c. Different types of painting equipment and functions

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
TRANS B9.4: Know how to mix, match, and apply paint. (70 points)	Student independently and properly matches paint, mixes a sufficient quantity of the correct tint, and applies auto refinish according to manufacturer's specifications and industry manuals without errors. (70 points)	Student independently and properly mixes, matches within .1 gram, and applies auto refinish to manufacturer's specifications. (60 points)	Student properly mixes, matches, and applies auto refinish to manufacturer's specifications within .2 gram. Student is provided limited supervision. (50 points)	Student does not properly mix, match, or apply auto refinish or requires direct supervision or substantial assistance to do so. Student is unable to correctly measure color formula in two attempts. (45 points)
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents. (10 points)	Work order is neat, detailed, clear, precise, and complete. Written report shows thorough understanding of color matching, color wheel, and the process of obtaining a color match. Written report includes accurate, complete definitions of hue, value, and chroma that demonstrate complete understanding of the concepts. (10 points)	Work order is neat, clear, and complete. Written report shows understanding of color matching, color wheel, and the process of obtaining a color match. Written report includes accurate and complete definitions of hue, value, and chroma that demonstrate solid understanding of the concepts. (8 points)	Work order may lack neatness, clarity, detail, or precision. Written report shows limited understanding of color matching, color wheel, and the process of obtaining a color match. Written report includes basic definitions of hue, value, and chroma that demonstrate limited understanding of the concepts. (6 points)	Work order lacks neatness, clarity, detail, and precision. Written report is unreadable or not present or shows almost no understanding of color matching, color wheel, and the process of obtaining a color match. Written report either does not include definitions or includes inaccurate definitions. (4 points)
Communications 2.4 Listening and Speaking Strategies and Applications (grade eight) 2.4: Deliver persuasive presentations. (10 points)	Oral report is clear, to the point, within time limit, and well structured.	Oral report is clear, to the point, and within time limit.	Oral report is clear but may go over or under time restrictions or occasionally depart from topic.	

Standards	Advanced	Proficient	Basic	Unacceptable
	Student is able to explain accurately in oral report all aspects of mixing, matching, and applying paint. Student discusses applying paint using different types of refinishing equipment. (10 points)	Student explains in oral report all aspects of mixing, matching, and applying paint. (8 points)	Student explains in oral report some aspects of mixing, matching, and applying paints. (7 points)	Student is unable to deliver clearly an oral report to class. (6 points)
Technology 4.4: Understand the role and function of tools, equipment, and machines in the latest technology. (10 points)	During mixing, measuring, and application of paint, student demonstrates thorough understanding of role and function of tools used. Student explains in an oral report the parts of all refinishing equipment and the uses of the equipment in the automotive field. (10 points)	During mixing, measuring, and application of paint, student demonstrates understanding of role and function of tools used. Student explains in an oral report the parts of most refinishing equipment and the uses of the equipment in the automotive field. (8 points)	During mixing, measuring, and application of paint, student demonstrates limited understanding of role and function of tools used. Student explains in an oral report the parts or the uses of most refinishing equipment. (7 points)	During mixing, measuring, and application of paint, student demonstrates no understanding of role and function of tools used. Student is unable to explain in an oral report parts and uses of refinishing equipment. (6 points)
Health and Safety 6.3: Use tools and machines safely and appropriately. (10 points)	Student follows all safety regulations without reminders or prompting. (10 points)	Student follows all safety regulations but may require limited reminders or prompting. (8 points)	Student follows all or nearly all safety regulations but requires significant reminders or prompting. (6 points)	Student does not follow most safety regulations despite reminders or prompting. (4 points)
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals. (10 points)	Teacher observes student taking leadership in organizing the group and coaching students on their assignments. (10 points)	Teacher observes student dividing assignments evenly among the team members and structuring individual work effectively. (8 points)	Teacher observes student delegating assignments to other students and inadequately structuring individual work. (6 points)	Teacher observes student not engaging in group or individual work. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Collision Repair and Refinishing Pathway Occupations	
High school (diploma)	• Collision Repair Intern or Apprentice • Refinisher Helper • Auto Detailer
Postsecondary training (certification and/or AA degree)	• Collision Repair Technician* • Collision Repair Shop Owner • Auto Refinish Technician* • Auto Glass Installer* • Assistant Manager
College or university (bachelor's degree or higher)	• Insurance Claims Adjuster • Collision Shop Manager • Instructor* • Paint Manufacturer Representative

Vehicle Maintenance, Service, and Repair

Sample sequence of courses in the Vehicle Maintenance, Service, and Repair pathway:

CTE courses	Related courses
Introductory • Introduction to Automotive Repair • Small Engines • Technology Core • Exploring Technology	• Electronics • Precision Machining • Welding • Algebra • English Composition/Writing
Concentration • Brakes • Electrical Systems and Electronics • Steering and Suspension • Outdoor Power Equipment • Auto Fundamentals	
Capstone • Advanced Automotive • Engine Performance/Smog • Motorcycle • Diesel	

Sample of appropriate foundation and pathway standards for the Brakes course in the Vehicle Maintenance, Service, and Repair pathway:

Foundation standards	**Academics 1.1 Mathematical Reasoning (grade seven) 2.8:** Make precise calculations and check the validity of the results from the context of the problem.
	Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.l: Analyze situations and solve problems that require combining and applying concepts from more than one area of science.

Foundation standards

Communications 2.2 Writing Applications (grades nine and ten) 2.6: Write technical documents:

a. Report information and convey ideas logically and correctly.
b. Offer detailed and accurate specifications.
c. Include scenarios, definitions, and examples to aid comprehension.
d. Anticipate readers' problems, mistakes, and misunderstandings.

Career Planning and Management 3.6: Know important strategies for self-promotion in the hiring process, such as job applications, résumé writing, interviewing skills, and preparation of a portfolio.

Technology 4.4: Understand the role and function of tools, equipment, and machines in the latest technology.

Health and Safety 6.1: Know the policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities.

Health and Safety 6.3: Use tools and machines safely and appropriately.

Leadership and Teamwork 9.2: Understand the ways in which preprofessional associations, such as SkillsUSA, and competitive career development activities enhance academic skills, promote career choices, and contribute to employability.

Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.

Demonstration and Application 11.0: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Pathway standards

TRANS C1.0: Students understand the value and necessity of practicing personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards.

TRANS C3.0: Students understand scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems.

TRANS C4.0: Students perform and document maintenance procedures in accordance with the recommendations of the manufacturer.

TRANS C6.0: Students understand the application, operation, maintenance, and diagnosis of engines, including but not limited to two- and four-stroke and supporting subsystems.

TRANS C7.0: Students understand the function, principles, and operation of electrical and electronic systems, using manufacturer and industry standards.

TRANS C8.0: Students understand the function and principles of automotive drivetrain, steering and suspension, brake, and tire and wheel components and systems in accordance with portable national industry standards, such as the National Automotive Technicians Education Foundation.

Sample analysis ("unpacking") of a standard for the Brakes course in the Vehicle Maintenance, Service, and Repair pathway:

Standard	**Transportation C8.0:** Students understand the function and principles of automotive drivetrain, steering and suspension, brake, and tire and wheel components and systems in accordance with portable national industry standards, such as the National Automotive Technicians Education Foundation.	
Standard subcomponent	**Transportation C8.2:** Diagnose, service, and repair disc brakes, drum brakes, antilock brakes, and other brake systems as developed.	
Course level	❑ **Introductory** ☒ **Concentration** ❑ **Capstone**	
What do students need to know? At what level?	*Concepts* 1. Identify brake systems. 2. Use technical manuals to determine minimum and maximum tolerances and wheel lug nut torque specifications. 3. Use troubleshooting guides and charts.	*Benchmarks* 1. Give basic definition of *brake systems.* 2. Give two examples of tolerances and wheel lug nut torque specifications from technical manuals. Discuss torque wrench and impact wrench. 3. Describe two different types of troubleshooting guides and charts and accurately diagnose problems, using a sample troubleshooting guide or chart.
What should students be able to do? At what level?	*Skills* 1. Measure brake rotor tolerances, using micrometers. 2. Identify brake components. 3. Torque wheel lug nuts properly.	*Benchmarks* 1. Use micrometer to measure brake rotor tolerances and determine whether rotor meets minimum and maximum specifications. 2. Identify components used in disc brakes and in drum brakes. 3. Torque all wheel lug nuts to manufacturer specifications.
Topics and contexts **What must be taught?**	1. Basics of brake system operation 2. Precision measurement tools, techniques, and skills 3. Documentation (in writing) of all work performed 4. Reading and interpretation of technical manuals and other technical information 5. Proper and safe use of tools and equipment required for performing tasks	

Sample Performance Task

Standards: This sample performance task targets the following Transportation industry sector foundation and Vehicle Maintenance, Service, and Repair pathway standards:

Standard number	Standards
Foundation: Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.1	Analyze situations and solve problems that require combining and applying concepts from more than one area of science.
Foundation: Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6	Write technical documents: a. Report information and convey ideas logically and correctly. b. Offer detailed and accurate specifications. c. Include scenarios, definitions, and examples to aid comprehension. d. Anticipate readers' problems, mistakes, and misunderstandings.
Foundation: Health and Safety 6.3	Use tools and machines safely and appropriately.
Foundation: Leadership and Teamwork 9.3	Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals.
Foundation: Demonstration and Application 11.0	Students demonstrate and apply the concepts contained in the foundation and pathway standards.
Pathway: TRANS C8.2	Diagnose, service, and repair disc brakes, drum brakes, antilock brakes, and other brake systems as developed.

Assignment: A vehicle has been brought in because of a problem with the vehicle's brakes. Your assignment is to:

1. Work in teams (Leadership and Teamwork 9.3) to:
   a. Write a repair order (Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.6; Demonstration and Application 11.0).
   b. Verify the customer's complaint (TRANS C8.2).
   c. Raise the vehicle, using required safety equipment and procedures (TRANS C8.2; Health and Safety 6.5; Demonstration and Application 11.0).
   d. Remove the wheels properly and inspect the brake components (TRANS C8.2; Demonstration and Application 11.0).
   e. Inspect and diagnose the brake system problem and/or need for repairs (TRANS C8.2; Academics 1.2 Investigation and Experimentation [grades nine through twelve] 1.1).
   f. Use micrometer to measure brake components for minimum and maximum manufacturer's tolerances (TRANS C8.2; Demonstration and Application 11.0).
   g. Reinstall brake components (TRANS C8.2; Demonstration and Application 11.0).
2. Write a short report (500 words minimum) in which you explain (TRANS C8.2; Communications 2.2 Writing Strategies and Applications [grades nine and ten] 2.6) the following:
   a. Various brake systems and how they operate
   b. Safety procedures used in performing a brake inspection and/or repair
   c. Why it is important to measure brake components to specific tolerances
   d. Importance of following manufacturer's recommendations

Performance task rubric: Your grade will be based on the following rubric:

Standards	Advanced	Proficient	Basic	Unacceptable
TRANS C8.2: Diagnose, service, and repair disc brakes, drum brakes, antilock brake, and other brake systems as developed. (60 points)	Student properly diagnoses and repairs brake system according to the manufacturer's guidelines and specifications within the manufacturer's specified time limits. Student identifies minimum and maximum tolerances and accurately measures parallelism and thickness to the manufacturer's specifications. (60 points)	Student properly diagnoses and repairs brake system according to the manufacturer's guidelines and specifications but may take additional time. Student identifies minimum and maximum tolerances and accurately measures minimum thickness to the manufacturer's specifications. (50 points)	Student properly diagnoses and repairs brake systems according to the manufacturer's guidelines with limited assistance. Student identifies some tolerances and measures minimum thickness. (40 points)	Student's work is not performed to manufacturer's specifications or acceptable brake system operation. Student is unable to measure components or use micrometer correctly. (30 points)
Academics 1.2 Investigation and Experimentation (grades nine through twelve) 1.1: Analyze situations and solve problems that require combining and applying concepts from more than one area of science. (10 points)	Student quickly and accurately diagnoses brake systems. Student thoroughly, thoughtfully, and accurately determines causes of wear and/or malfunction based on information obtained in brake inspection and prior knowledge. (10 points)	Student accurately diagnoses brake systems. Student accurately determines causes of wear and/or malfunction based on information obtained in brake inspection and prior knowledge. (8 points)	Student diagnoses brake systems with limited assistance. With limited assistance student determines causes of wear and/or malfunction based on information obtained in brake inspection and prior knowledge. (6 points)	Student is unable to diagnose brake system problem or determine cause of wear. (4 points)
Communications 2.2 Writing Strategies and Applications (grades nine and ten) 2.6: Write technical documents. (10 points)	Repair order includes all customer information, lists all requested repairs, and contains correct calculations, with no items missing.	Repair order includes customer information, lists requested repairs, and contains correct calculations but may include up to two errors or omissions.	Repair order includes customer information, lists requested repairs, and contains correct calculations but may include up to three errors or omissions.	Repair order includes customer information, lists requested repairs, and contains correct calculations but may include up to four errors or omissions.

Standards	Advanced	Proficient	Basic	Unacceptable
	Written report is accurate and complete and demonstrates thorough understanding of types of brake systems, how they operate, safety procedures, importance of brake tolerances, and importance of manufacturer recommendations. (10 points)	Written report is accurate and complete and demonstrates solid understanding of types of brake systems, how they operate, safety procedures, importance of brake tolerances, and importance of manufacturer recommendations. (8 points)	Written report is mostly accurate and complete and demonstrates understanding of types of brake systems, how they operate, safety procedures, importance of brake tolerances, and importance of manufacturer recommendations. (7 points)	Written report is inaccurate or incomplete or indicates limited to no understanding of types of brake systems, how they operate, safety procedures, importance of brake tolerances, or importance of manufacturer recommendations. (6 points)
Health and Safety 6.3: Use tools and machines safely and appropriately. (10 points)	Student follows all safety regulations without reminders or prompting. (10 points)	Student follows all safety regulations but may require limited reminders or prompting. (8 points)	Student follows all or nearly all safety regulations but requires significant reminders or prompting. (6 points)	Student does not follow most safety regulations despite reminders or prompting. (4 points)
Leadership and Teamwork 9.3: Understand how to organize and structure work individually and in teams for effective performance and the attainment of goals. (10 points)	Teacher observes student taking leadership in organizing the group and coaching students on their assignments. (10 points)	Teacher observes student dividing assignments evenly among the team members and structuring individual work effectively. (8 points)	Teacher observes student delegating assignments to other students and structuring individual work inadequately. (6 points)	Teacher observes student not engaging in group or individual work. (0 points)

Note: Demonstration and Application 11.0 is included in all of the preceding items.

Sample of pathway occupations: This sample of pathway occupations is organized by level of education and training required for workforce entry. Asterisked occupations require certification or licensure.

Vehicle Maintenance, Service, and Repair Pathway Occupations	
High school (diploma)	• Porter/Lot Person • Lube Technician • Aftermarket Sales Representative • Vehicle Maintenance Intern or Apprentice • Parts and Service Counter Person • Salesperson • Vehicle Maintenance Technician
Postsecondary training (certification and/or AA degree)	• Line Technician • Service Writer • Motor Carrier • Technical Writer • Smog Technician* • Driver • Inspector
College or university (bachelor's degree or higher)	• Fleet Manager or Director • Shop Foreman or Forewoman • Parts and Service Manager • Instructor* • Manufacturer's Representative

Glossary

Advisory committee or council. A group of business, industry, and community representatives providing technical support and expertise to educators on the design, development, content, operation, evaluation, and revision of CTE programs.[1]

a–g subject requirements. Subject-area admission requirements created by the University of California's Academic Senate and adopted by both the University of California system and the California State University system. Fifteen year-long courses in the areas of (a) History–Social Science, (b) English, (c) Mathematics, (d) Laboratory Science, (e) Languages Other Than English, (f) Visual and Performing Arts, and (g) College Preparatory Electives make up the full a–g complement of courses. Courses must be certified by the university as meeting the requirements and added to the school's UC-certified course list to fulfill a–g admissions requirements.

Americans with Disabilities Act (ADA). A 1990 federal law that prohibits discrimination toward individuals with disabilities and guarantees equal access and equal opportunities to individuals with disabilities.

Apprenticeship. An instructional delivery system established in California by the Shelley-Maloney Apprenticeship Labor Standards Act of 1939. It is a relationship between an employer and an employee during which the worker, or apprentice, learns an occupation in a structured program sponsored by a single employer, employer associations, or a jointly sponsored labor and management association. (See also *Apprenticeship program* and *Registered apprenticeship program*.)

Apprenticeship program. An instructional program that contains *apprenticeship* standards, committee rules and regulations, related supplemental instruction, course outlines, and policy statements for the administration of an apprenticeable occupation. (See also *Registered apprenticeship program*.)

Apprenticeship program sponsor. A single employer, an employers' association, or a joint labor and management association sponsoring an *apprenticeship program*. Sponsors and employers develop standards, evaluate work-site conditions, determine the availability of facilities, review equipment, identify skilled workers to serve as trainers, and schedule work.

Apprenticeship program standards. Procedures for the fair and equal selection, employment, and training of apprentices developed by *apprenticeship program sponsors* and educators.

Articulation. The practice of aligning curriculum and instruction to offer a seamless *career pathway* transition between courses, grades, or schools.

Articulation agreement. A written agreement at the state, district, or school level that creates a sequence of progressive, nonduplicated education leading to technical skill proficiency, a credential, a certificate, or a degree. Typically, credit transfer agreements between institutions are key components of the articulation agreement.[2]

California High School Exit Examination (CAHSEE). A standardized test administered to all public high school students in California. Students cannot receive a high school diploma without a passing score on the *CAHSEE,* which is part of California's *Standardized Testing and Reporting Program*.[3]

California Partnership Academy. A *CTE program* that includes work-based training during the last half of grade twelve and consists of the following:

- A school-within-a-school program that works to motivate students who may otherwise not complete high school or participate in activities to graduate with their classmates
- A career-oriented program that directly involves local employers and strives to provide students with skills applicable to the workplace
- A partnership between a school district, local employers, and the California Department of Education
- A voluntary program on the part of both students and parents (See also *Career academy*.)

Capstone course. The final course in a planned sequence of courses for a CTE program that provides a rigorous and intensive culmination of a course of study. Capstone courses are typically offered through *regional occupational centers and programs (ROCPs).*

Career academy. A small learning community characterized by (1) a group of students within the larger high school who take classes together for at least two years and are taught by a team of teachers from different disciplines; (2) an academic curriculum combined with a career technical curriculum with a career theme, enabling students to see relationships among academic subjects and their application to a broad field of work; and (3) partnerships with employers, the community, and local colleges, bringing resources from outside the high school to improve student motivation and achievement.[4]

Career pathway. A coherent, planned sequence of career technical education courses detailing the knowledge and technical skills students need to succeed in a specific career area.

Career technical education (CTE). Organized educational activities that provide coherent, rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in current or emerging professions. CTE provides technical skill proficiency, an industry-recognized credential, a certificate, or a degree and includes competency-based applied learning that contributes to students' academic knowledge, higher-order reasoning and problem-solving skills, attitudes toward work, general employability skills, technical skills, occupation-specific skills, and knowledge of all aspects of an industry, including entrepreneurship.

Career technical student organization (CTSO). A preprofessional organization for individuals enrolled in a CTE program that engages in career and technical education activities as an integral part of the instructional program. CTSOs develop leadership skills, provide competitive career development activities, enhance academic skills, promote career choices, and contribute to employability. Activities are an integral part of the instructional program. Examples of CTSOs include DECA, FBLA, FFA, FHA-HERO, HOSA, and SkillsUSA.

Carl D. Perkins Vocational and Technical Education Act. A federal act to improve career technical education programs, integrate academic and career technical instruction, serve special populations, and meet gender equity needs.

Community classroom. *Instructional methodology* that uses unpaid *on-the-job training* experiences at business, industry, and public agency sites to assist students in acquiring competencies (skills, knowledge, and attitudes) necessary to obtain entry-level employment. Community classroom methodology extends instruction into the workplace setting and helps the student acquire saleable skills. Typically, the community classroom strategy is used in *internships, externships,* and *ROCPs*.

Community partnership. Collaboration of educators or educational institutions with local outside agencies (e.g., government, business, industry, social work) to achieve mutual goals.

Concentration course. A CTE course beyond the introductory level that is intended to provide more in-depth instruction in and exploration of a specific *industry sector;* the second course and succeeding courses of a planned CTE program sequence.

Course sequence. Two or more related CTE courses taken in sequence. A course sequence provides individuals with coherent, rigorous content aligned with the challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in current or emerging professions.

CTE course. A single course that focuses on developing technical and academic skills within a career area aligned with state-adopted CTE and academic standards and relevant technical knowledge and skills.

CTE program. A coherent sequence of rigorous career technical and academic courses at the school level that prepares students for successful completion of state academic standards, readies all students for entry-level careers, and lays the foundations for more advanced postsecondary training.

CTE Standards and Framework Advisory Group. A representative group of classroom teachers, school administrators, parents, postsecondary educators, and representatives of business and industry appointed by the State Superintendent of Public Instruction to provide input and feedback on the CTE standards and framework.

Differentiated instruction. Instruction matched to individual students' needs, readiness, interests, circumstances, and learning profiles.

English learner. A student not yet fluent in English.

Exemplar. An example of proficient or advanced student work given to students at the beginning of an assignment to provide a model or framework.

Externship. An experiential learning opportunity, similar to an *internship*, offered by schools in collaboration with employers to give students short, practical experiences in their field of study. Externships are generally unpaid and are conducted for course credit at the school.

Formative analysis. The continuous monitoring of short-term results and procedures to provide ongoing information useful in the improvement of student achievement.[5]

Foundation standards. Eleven core *standards* that support mastery of essential employability skills and rigorous academic content *standards*.

Grouping. A type of *differentiated instruction* in which students in a class are divided into smaller groups for instruction.

Higher-order thinking. The cognitive processes of analysis, comparison, inference and interpretation, evaluation, and synthesis applied to a range of academic domains and problem-solving contexts. The definition used in creating the CTE *standards* is based on Robert Marzano's revision of Bloom's *Taxonomy*.[6]

Industry sector. A group of related occupations within a broad industry. California has identified 15 industry sectors: Agriculture and Natural Resources; Arts, Media, and Entertainment; Building Trades and Construction; Education, Child Development, and Family Services; Energy and Utilities; Engineering and Design; Fashion and Interior Design; Finance and Business; Health Science and Medical Technology; Hospitality, Tourism, and Recreation; Information Technology; Manufacturing and Product Development; Marketing, Sales, and Service; Public Services; and Transportation.

Instructional methodologies. A body of practices, strategies, procedures, and rules designed to foster and support student learning.

Instructional strategies. A number of classroom instructional practices designed to foster and support student learning.

Internship. A generic term for a workplace learning position. Participants may or may not be paid.

Introductory course. An initial or survey course in a CTE program intended to provide a beginning or introductory level of information about an *industry sector* or *career pathway;* the first course in a CTE *course sequence*.

Job shadowing. An activity during which a student follows and observes an individual on the job for a designated number of hours or days as that individual performs workplace tasks.

Journeyman. A person who has either (1) completed an accredited *apprenticeship* in his or her craft; or (2) completed the equivalent of an *apprenticeship* in length and content of work experience as well as all other requirements of the craft.

Lexile rating. A developmental scale for reading ranging from below 200L for beginning-reader material to above 1700L for advanced text.[7]

Local educational agency (LEA). A public board of education or other public authority within a state that maintains administrative control of public elementary or secondary schools in a city, county, township, school district, or other political subdivision.[8]

On-the-job training. A form of employment training that requires the student to work outside the school at a business or other type of work site.

Pacing. A type of *differentiated instruction* in which the speed at which the material is covered is adjusted according to individual students' needs and circumstances.

Pacing guide. A timeline indicating when each *standard* will be taught or supported and assessed during the school year.

Pathway standard. A statement of knowledge or skills deemed to be essential for all students in a given *career pathway*.

Performance task. An authentic assessment modeled after a real-life task or situation that provides a student an opportunity to demonstrate his or her abilities and apply knowledge and skills.

Preapprenticeship. A course of study offered by program sponsors to potential registered *apprenticeship* program applicants. Typically, content is focused on the basic skills that must be demonstrated successfully on program entrance examinations.

Professional development. Formal or informal training and education to enhance professional skills, knowledge, and ability.

P–16. An integrated system of education that extends from preschool to grade sixteen and culminates in a bachelor's degree or other four-year degree.

Regional occupational centers and programs (ROCPs). Centers and programs authorized by the California Legislature to provide individual counseling and guidance in career technical matters to high-school age youths. Each ROCP provides a CTE curriculum that includes skill training in locally relevant occupational fields that may lead to entry-level employment opportunities. ROCPs are required to have related business and industry *advisory committees* that approve the industry-based curriculum. ROCPs collaborate with other public and private agencies, labor organizations, and other associations to develop and offer relevant courses and work-study opportunities to meet labor market demands.

Registered apprenticeship program. Those *apprenticeship programs* in California that meet specific state-approved standards designed to safeguard the welfare of apprentices and are registered with the Division of Apprenticeship Standards.

Rubric. An assessment tool that provides scoring guidelines and descriptions of categories or levels of performance.

School-to-Work Opportunities Act. Federal legislation passed in May 1994 to bring attention and structure to *work-based learning* and workforce preparation.

Secretary's Commission on Achieving Necessary Skills (SCANS). The Department of Labor's SCANS is composed of representatives from education, business, labor, and government. SCANS has identified a set of foundation competencies, work competencies, and skills needed for success in the workplace.

Service learning. A method of instruction whereby students or participants learn and develop skills through unpaid active participation in community service. It integrates and enhances the academic curriculum of the students or the educational components of the local community service program.

SkillsUSA. A career technical student organization dedicated to helping its members develop solid technical, leadership, and employability skills. In addition, it supports and rewards the efforts of its members through *professional development* and recognition programs.

Special needs students. Students protected under the *Americans with Disabilities Act (ADA)* who have or are at risk of a chronic physical, developmental, behavioral, or emotional condition and who, as a result, require additional developmental, health, mental health, or other services and/or supports.

Stakeholders. Persons who have interest in, sponsor, conduct, are directly influenced by, use, or benefit from education projects and programs.

Standard. In California's career technical model curriculum standards, a broad statement of knowledge or skills that indicates what students in a given sector or *career pathway* should know or be able to do.

Standardized Testing and Reporting Program (STAR Program). The system of standardized tests that California uses to assess student, school, district, and statewide progress. The tests included are the *California Standards Test (CST); California Alternate Performance Assessment (CAPA); California Achievement Tests, Sixth Edition Survey (CAT/6 Survey); Aprenda, La prueba de logros en español, Tercera edición (Aprenda 3); California English Language Development Test (CELDT); California High School Exit Examination (CAHSEE); Early Assessment Program (EAP); Physical Fitness Test (PFT); California High School Proficiency Examination (CHSPE); General Educational Development (GED);* and *National Assessment of Educational Progress (NAEP).*

Standard subcomponent. In California's career technical model curriculum standards, one of a series of specific statements of knowledge or skills that provides detail on the component aspects of a *standard*.

Technical skills. Specialized procedures and methods used in any specific career.

Tech-Prep. A planned sequence of study in a technical field or *career pathway* program that begins as early as grade nine and extends through (1) two or more years of postsecondary education; or (2) an *apprenticeship* program of at least two years' duration that follows secondary instruction. The sequence culminates in a degree or certificate.

WorkAbility. A California Department of Education program providing comprehensive preemployment training, employment placement, and follow-up for high school students in special education making the transition to work, independent living, and postsecondary education or training.

Work-based learning. Course-linked learning experiences that are outside the classroom and include an employer or community connection. Examples include *preapprenticeship*, *job shadowing*, mentorship, *internship*, clinical experience, work-study, informational interview, attendance at trade shows, field experience, career-related *service learning*, or other learning experience fundamentally external to the classroom.

Work experience education. A statewide program designed to provide students with workplace learning positions, that may be coordinated with instruction. However, such work is not necessarily coordinated with a particular career theme or course of study. Students may work for credit and payment (General and Vocational Work Experience Education) or for credit and no payment (Exploratory Work Experience Education).

Workforce Investment Act. A 1998 federal statute that consolidated more than 60 federal workforce, literacy, and rehabilitation training programs through three block grants to the states: Adult Employment and Training, Disadvantaged Youth Employment and Training, and Dislocated Worker Employment and Training.

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Abbreviations

API	Academic Performance Index
ASCA	American School Counselor Association
ASCD	Association for Supervision and Curriculum Development
ASVAB	Armed Services Vocational Aptitude Battery
AYES	Automotive Youth Education System
AYP	Adequate Yearly Progress
CAHSEE	*California High School Exit Examination*
CalCRN	California Career Resource Network
CBEA	California Business Education Association
CDE	California Department of Education
CITEA	California Industrial and Technology Association
CPA	California Partnership Academy
CST	*California Standards Test*
CSU	California State University
CTE	Career Technical Education
CTSO	Career Technical Student Organization
DECA	An Association of Marketing Students
EAP	Early Assessment Program
EL	English Learners
ELD	English Language Development
ES	Effect Size
FAST	Focused Approach to Standards and Testing
FBLA	Future Business Leaders of America
FFA	Future Farmers of America
FHA-HERO	Future Homemakers of America–Home Economics Related Occupations
FordPAS	Ford Partnership for Advanced Studies
GP	Grading Period

GPS	Global Positioning System
HIV	Human Immunodeficiency Virus
HOSA	Health Occupations Students of America
IEP	Individualized Education Program
II/USP	Intermediate Intervention/Underperforming Schools Program
JA	Junior Achievement, Inc.
JROTC	Junior Reserve Officers' Training Corps
LEA	Local Educational Agency
O*NET	Occupational Information Network
PSI	Pounds per Square Inch
REAL	Rural Entrepreneurship Through Active Learning
ROCPs	Regional Occupational Centers and Programs
RSI	Related and Supplemental Instruction
SAE	Supervised Agricultural Experience
SAIT	School Assessment and Intervention Team
SARC	School Accountability Report Card
SAT	*Scholastic Aptitude Test*
SCANS	Secretary's Commission on Achieving Necessary Skills
SLC	Smaller Learning Community
SREB	Southern Regional Education Board
SSP	Specialized Secondary Program
STAR	*Standardized Testing and Reporting*
TSA	Technology Student Association
UC	University of California
WASC	Western Association of Schools and Colleges
WIA	Workforce Investment Act
WIB	Workforce Investment Board

Selected References

This section contains a list of references arranged by section. The references have wide application across many areas of kindergarten-through-grade-twelve education. Questions about the references should be addressed to the High School Initiatives/Career Education Office, California Department of Education; telephone (916) 319-0893.

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