

# California Career Technical Education Model Curriculum Standards

Grades Seven  
Through Twelve



*Adopted by the  
California State Board  
of Education  
May, 2005*

California Career  
Technical Education  
Model Curriculum  
Standards

Grades Seven  
Through Twelve



## Publishing Information

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### Notice

The guidance in *California Career Technical Education Model Curriculum Standards, 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.)

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

California is a national leader in the development of rigorous, comprehensive standards as the foundation for educational programs. Toward that end, we are pleased to provide these curriculum standards for career technical education (CTE). They integrate California's rigorous academic content standards with industry-specific knowledge and skills to prepare students both for direct entry into California's vibrant industry sectors and for postsecondary education. The CTE standards are the collaborative effort of secondary and postsecondary educators, representatives from industry and key educational organizations, legislators, students, and families.

Reform in education requires a vision of where we want to be, a solid foundation, and effective strategies to reach our objective. For CTE these curriculum standards are the foundation, identifying what is essential for students to master in each of the 15 industry sectors. With them in place, our schools can create, implement, and strengthen a CTE curriculum that benefits our youth, our communities, and our economy. Career technical education is a vital component of public education in California.

### *Standards are based in research.*

Standards provide a focus on content—that is, what students actually need to know and be able to do. In 1991 the U.S. Secretary of Labor's report *Secretary's Commission on Achieving Necessary Skills (SCANS)* identified foundation knowledge, skills and abilities, and essential workplace competencies necessary to be competitive in our global, information-based economy. California's CTE standards take the critical next step in providing the level of specificity needed to guide the development of high-quality, consistent, and relevant career-focused programs.

### *Standards are rigorous and relevant.*

Narrow, job-skill-oriented secondary vocational programs of the past—that prepared individuals almost exclusively for entry into trades—have given way to broader CTE pro-

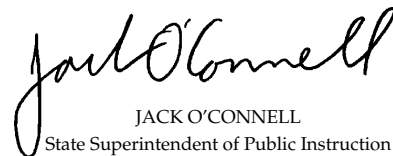
grams. These programs teach rigorous academic concepts within the context of career education. The CTE curriculum standards show direct linkages to California's content standards in English–language arts, mathematics, history–social science, science, and visual and performing arts, and they provide learning opportunities in many venues both within and outside the traditional classroom.

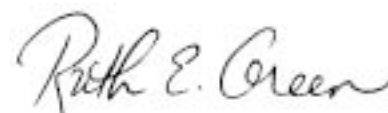
### *Standards describe what to teach, not how to teach it.*

Standards-based education maintains California's historical respect for local control of schools. To help students achieve at high levels, local educators—with the cooperation of families, businesses, and community partners—can take these standards and design the specific curricular and instructional strategies that best deliver the content to their students.

### *Standards are a continuing commitment to excellence.*

Standards answer the critical question, "What should our students be learning?" They represent a concerted effort to prepare our students with the knowledge and skills to make informed career choices, to integrate and apply academic and career concepts, to prepare for successful participation in our global society, and to seek and love learning as a lifelong endeavor. They represent our commitment to excellence.

  
JACK O'CONNELL  
State Superintendent of Public Instruction

  
RUTH E. GREEN, *President*  
California State Board of Education



# Introduction

The California career technical education (CCTE) model curriculum standards are organized in 15 *industry sectors*, or groupings, of interrelated occupations and broad industries. Each sector has two or more career pathways. (See the accompanying chart for an overview of the sectors and pathways.) A *career pathway* is a coherent sequence of

rigorous academic and technical courses that allows students to apply academics and develop technical skills in a curricular area. Career pathways prepare students for successful completion of state academic and technical standards and more advanced postsecondary course work related to the career in which they are interested.

## California Career Technical Education Industry Sectors

INDUSTRY SECTOR	CAREER PATHWAYS	INDUSTRY SECTOR	CAREER PATHWAYS
<b>Agriculture and Natural Resources</b>	<ul style="list-style-type: none"> <li>• <i>Agricultural Business</i></li> <li>• <i>Agricultural Mechanics</i></li> <li>• <i>Agriscience</i></li> <li>• <i>Animal Science</i></li> <li>• <i>Forestry and Natural Resources</i></li> <li>• <i>Ornamental Horticulture</i></li> <li>• <i>Plant and Soil Science</i></li> </ul>	<b>Energy and Utilities</b>	<ul style="list-style-type: none"> <li>• <i>Electromechanical Installation and Maintenance</i></li> <li>• <i>Energy and Environmental Technology</i></li> <li>• <i>Public Utilities</i></li> <li>• <i>Residential and Commercial Energy and Utilities</i></li> </ul>
<b>Arts, Media, and Entertainment</b>	<ul style="list-style-type: none"> <li>• <i>Media and Design Arts</i></li> <li>• <i>Performing Arts</i></li> <li>• <i>Production and Managerial Arts</i></li> </ul>	<b>Engineering and Design</b>	<ul style="list-style-type: none"> <li>• <i>Architectural and Structural Engineering</i></li> <li>• <i>Computer Hardware, Electrical, and Networking Engineering</i></li> <li>• <i>Engineering Design</i></li> <li>• <i>Engineering Technology</i></li> <li>• <i>Environmental and Natural Science Engineering</i></li> </ul>
<b>Building Trades and Construction</b>	<ul style="list-style-type: none"> <li>• <i>Cabinetmaking and Wood Products</i></li> <li>• <i>Engineering and Heavy Construction</i></li> <li>• <i>Mechanical Construction</i></li> <li>• <i>Residential and Commercial Construction</i></li> </ul>	<b>Fashion and Interior Design</b>	<ul style="list-style-type: none"> <li>• <i>Fashion Design, Manufacturing, and Merchandising</i></li> <li>• <i>Interior Design, Furnishings, and Maintenance</i></li> </ul>
<b>Education, Child Development, and Family Services</b>	<ul style="list-style-type: none"> <li>• <i>Child Development</i></li> <li>• <i>Consumer Services</i></li> <li>• <i>Education</i></li> <li>• <i>Family and Human Services</i></li> </ul>		

INDUSTRY SECTOR	CAREER PATHWAYS
<b>Finance and Business</b>	<ul style="list-style-type: none"> <li>Accounting Services</li> <li>Banking and Related Services</li> <li>Business Financial Management</li> </ul>
<b>Health Science and Medical Technology</b>	<ul style="list-style-type: none"> <li>Biotechnology Research and Development</li> <li>Diagnostic Services</li> <li>Health Informatics</li> <li>Support Services</li> <li>Therapeutic Services</li> </ul>
<b>Hospitality, Tourism, and Recreation</b>	<ul style="list-style-type: none"> <li>Food Science, Dietetics, and Nutrition</li> <li>Food Service and Hospitality</li> <li>Hospitality, Tourism, and Recreation</li> </ul>
<b>Information Technology</b>	<ul style="list-style-type: none"> <li>Information Support and Services</li> <li>Media Support and Services</li> <li>Network Communications</li> <li>Programming and Systems Development</li> </ul>

INDUSTRY SECTOR	CAREER PATHWAYS
<b>Manufacturing and Product Development</b>	<ul style="list-style-type: none"> <li>Graphic Arts Technology</li> <li>Integrated Graphics Technology</li> <li>Machine and Forming Technology</li> <li>Welding Technology</li> </ul>
<b>Marketing, Sales, and Service</b>	<ul style="list-style-type: none"> <li>E-Commerce</li> <li>Entrepreneurship</li> <li>International Trade</li> <li>Professional Sales and Marketing</li> </ul>
<b>Public Services</b>	<ul style="list-style-type: none"> <li>Human Services</li> <li>Legal and Government Services</li> <li>Protective Services</li> </ul>
<b>Transportation</b>	<ul style="list-style-type: none"> <li>Aviation and Aerospace Transportation Services</li> <li>Collision Repair and Refinishing</li> <li>Vehicle Maintenance, Service, and Repair</li> </ul>

## Standards and Subcomponents

Standards serve as the basis for the curriculum frameworks, instructional materials, and statewide assessments in California. The CCTE model curriculum standards have been developed for use at the secondary level, grades seven through twelve.

There are two levels of detail in the standards: standards and subcomponents. *Standards* are general expectations of what students should know and be able to do. Each standard has at least two *subcomponents* that elaborate on the specific knowledge and skills encompassed by the standard.

There are also two different *types* of standards in each sector: *foundation* standards and *pathway* standards.

## Foundation Standards

There are 11 *foundation standards* that all students need to master to be successful in the career technical education curriculum and in the workplace. These standards are similar to the competencies described in the June 1991 report issued by the U. S. Department of Labor, *Secretary’s Commission on Achieving Necessary Skills (SCANS)*. The foundation standards are uniform in all sectors, although the subcomponents will differ. They cover the 11 areas essential to all students’ success:

- 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

Foundation standards 1.0, Academics, and 2.0, Communications, refer to the California academic content standards (see <http://www.cde.ca.gov/be/st/ss>). The academic standards are the relevant California content standards that individual sectors will integrate into the pathway standards, support, and reinforce through application. Most academic standards appear in foundation standard 1.0, Academics, although English–language arts standards are listed under 2.0, Communications, as they are broad-based enough to include most communication standards for the sector.

### *Pathway Standards*

The *pathway standards* are concise statements that reflect the essential knowledge and skills students are expected to master to be successful in the career pathway. These standards build on existing career technical education standards, academic content standards, and appropriate standards established by business and industry. Therefore, existing career technical standards, California content standards in the core content areas, and national, regional, and association standards (where available) were consulted as models of content description for technical standards. Each career pathway comprises three to twelve standards with two to six subcomponents per standard.

## **The Conceptual Model**

The conceptual model for the CCTE model curriculum standards was built on the Standards Development Criteria adopted by the Superintendent’s Advisory Group.

CCTE standards:

- Are designed to support a seamless transition to postsecondary education and entry to a career.
- Support mastery of essential employability skills and rigorous academic content standards.
- Are concise statements that reflect the essential knowledge and skills students are expected to master and include foundation standards that apply to all industry sectors.
- Build on existing career technical education standards, appropriate standards established by business and industry, and academic content standards.

The California Department of Education sought a research-based standards model that:

- Encompassed these guidelines
- Reflected the national movement away from codifying activities and tasks toward a broad curriculum capturing the underlying knowledge and skills
- Included both the core academic content and technical skills taught in a career pathway
- Reflected how students learn, recall, and transfer knowledge

The work of John R. Anderson at Carnegie Mellon University suggests that students learn through the interaction of declarative and procedural knowledge: *declarative knowledge* provides information (facts, events, concepts, and principles); *procedural knowledge* provides the application, or what the learner is able to do with the information. The interaction with these two types of knowledge will give students the ability to adapt and use information and skills in real-world situations.

The Department also screened academic foundation standards by using the ratings developed by Willard Daggett, International

Center for Leadership in Education, reflecting how readily an academic standard can be incorporated into technical instruction.

John Kendall and Robert Marzano of the Mid-continent Research for Education and Learning (McREL), under the regional educational laboratory contract from the U.S. Department of Education, have developed a model that incorporates a research-based format for writing content standards and subcomponents that:

- Incorporates both declarative and procedural statements

- Focuses on the higher-order declarative statements, often expressed as what the student “understands” or “knows”
- Uses clear, concise statements of the underlying (declarative) knowledge and skills and the main, overarching performance requirements (procedural), resulting in fewer but more important standards

The Superintendent’s Advisory Group adopted the McREL format as the basis for development of the *California Career Technical Education Model Curriculum Standards*.



# **Agriculture and Natural Resources Industry Sector**

## *Career Pathways*

- ◆ Agricultural Business
- ◆ Agricultural Mechanics
- ◆ Agriscience
- ◆ Animal Science
- ◆ Forestry and Natural Resources
- ◆ Ornamental Horticulture
- ◆ Plant and Soil Science



# Agriculture and Natural Resources Industry Sector

The Agriculture and Natural Resources sector is designed to provide a foundation in agriculture for all agriculture students in California. Students engage in an instructional program that integrates academic and technical preparation and focuses 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 skills development prepare students for continued training, advanced educational opportunities, or entry to a career.

## FOUNDATION STANDARDS

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### 1.0 Academics

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

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, and history–social science content standards adopted by the State Board of Education.)*

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#### 1.1 Mathematics

Specific applications of Algebra I standards (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.
- (12.0) Students simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.

- (13.0) Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.
- (15.0) Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.

Specific applications of Geometry standards (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.
- (10.0) Students compute areas of polygons, including rectangles, scalene triangles, equilateral triangles, rhombi, parallelograms, and trapezoids.
- (11.0) Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.
- (12.0) Students find and use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems.

Specific applications of Probability and Statistics standards (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.

## 1.2 Science

Specific applications of Investigation and Experimentation standards (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.
- (1.c) Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.
- (1.d) Formulate explanations by using logic and evidence.
- (1.f) Distinguish between hypothesis and theory as scientific terms.
- (1.j) Recognize the issues of statistical variability and the need for controlled tests.
- (1.l) Analyze situations and solve problems that require combining and applying concepts from more than one area of science.
- (1.m) Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.

## 1.3 History–Social Science

Specific applications of Principles of Economics standards (grade twelve):

- (12.2) Students analyze the elements of America’s market economy in a global setting.

- (12.2.2) Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.
- (12.2.3) Explain the roles of property rights, competition, and profit in a market economy.
- (12.2.5) Understand the process by which competition among buyers and sellers determines a market price.
- (12.2.6) Describe the effect of price controls on buyers and sellers.
- (12.2.7) Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.
- (12.2.10) Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.
- (12.4) Students analyze the elements of the U.S. labor market in a global setting.
- (12.4.3) Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.

## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English-language arts content standards adopted by the State Board of Education.)*

### 2.1 Reading

Specific applications of Reading Comprehension standards (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.
- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (2.3) Generate relevant questions about readings on issues that can be researched.
- (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).
- (2.7) Critique the logic of functional documents by examining the sequence of information and procedures in anticipation of possible reader misunderstandings.
- (2.8) Evaluate the credibility of an author's argument or defense of a claim by critiquing the relationship between generalizations and evidence, the comprehensiveness of evidence, and the way in which the author's intent affects the structure and tone of the text (e.g., in professional journals, editorials, political speeches, primary source material).

Specific applications of Reading Comprehension standards (grades eleven and twelve):

- (2.1) Analyze both the features and the rhetorical devices of different types of public documents (e.g., policy statements, speeches, debates, platforms) and the way in which authors use those features and devices.
- (2.3) Verify and clarify facts presented in other types of expository texts by using a variety of consumer, workplace, and public documents.
- (2.4) Make warranted and reasonable assertions about the author's arguments by using elements of the text to defend and clarify interpretations.

## 2.2 Writing

Specific applications of Writing Strategies and Applications standards (grades nine and ten):

- (1.1) Establish a controlling impression or coherent thesis that conveys a clear and distinctive perspective on the subject and maintain a consistent tone and focus throughout the piece of writing.
- (1.2) Use precise language, action verbs, sensory details, appropriate modifiers, and the active rather than the passive voice.
- (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.
- (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).
- (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.
- (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.
- (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.

Specific applications of Writing Strategies and Applications standards (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.
- (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).
- (1.7) Use systematic strategies to organize and record information (e.g., anecdotal scripting, annotated bibliographies).
- (1.8) Integrate databases, graphics, and spreadsheets into word-processed documents.
- (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.
- (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.

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### 2.3 *Written and Oral English Language Conventions*

Specific applications of English Language Conventions standards (grades eleven and twelve):

- (1.1) Demonstrate control of grammar, diction, and paragraph and sentence structure and an understanding of English usage.



- (1.2) Produce legible work that shows accurate spelling and correct punctuation and capitalization.
- (1.3) Reflect appropriate manuscript requirements in writing.

#### 2.4 *Listening and Speaking*

Specific applications of Listening and Speaking Strategies and Applications standards (grades nine and ten):

- (1.1) Formulate judgments about the ideas under discussion and support those judgments with convincing evidence.
- (1.7) Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.
- (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.
- (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.

Specific applications of Listening and Speaking Strategies and Applications standards (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
- (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").

- (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

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### 3.0 Career Planning and Management

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

- 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.

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### 4.0 Technology

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

- 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.
- 4.4 Understand geographic information systems (G.I.S.).
- 4.5 Determine the validity of the content and evaluate the authenticity, reliability, and bias of electronic and other resources.
- 4.6 Differentiate among, select, and apply appropriate tools and technology.

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## 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:

- 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.

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## 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:

- 6.1 Know 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.
- 6.3 Understand how to locate important information on a material safety data sheet.
- 6.4 Maintain safe and healthful working conditions.
- 6.5 Use tools and machines safely and appropriately.
- 6.6 Know how to both prevent and respond to accidents in the agricultural industry.

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## 7.0 Responsibility and Flexibility

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

- 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.
- 7.5 Understand the importance of time management to fulfill responsibilities.
- 7.6 Know how to apply high-quality craftsmanship to a product or presentation and continually refine and perfect it.

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## 8.0 Ethics and Legal Responsibilities

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

- 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.
- 8.4 Understand how to access, analyze, and implement quality assurance information.

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## 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:

- 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, such as the Future Farmers of America (FFA), 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.
- 9.6 Understand leadership, cooperation, collaboration, and effective decision-making skills applied in group or team activities, including the student organization.

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## 10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Agriculture and Natural Resources sector:

- 10.1 Understand the aims, purposes, history, and structure of the FFA student organization, and know the opportunities it makes available.
- 10.2 Manage and actively engage in a career-related, supervised agricultural experience.

- 10.3 Understand the importance of maintaining and completing the California Agricultural Record Book.
- 10.4 Maintain and troubleshoot equipment used in the agricultural industry.

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## **11.0 Demonstration and Application**

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

## PATHWAY STANDARDS

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### A. Agricultural Business Pathway

In the Agricultural Business Pathway, students learn about agricultural business operation and management. Topics include accounting, finance, economics, business organization, marketing, and sales.

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*A1.0 Students understand decision-making processes within the American free enterprise system:*

- A1.1 Differentiate among the components of the American free enterprise system and other forms of economic systems.
  - A1.2 Distinguish among the main characteristics of individual proprietorships, partnerships, corporations, and cooperatives.
  - A1.3 Understand the advantages and disadvantages of the four types of business ownership.
  - A1.4 Analyze appropriate decision-making tools and financial records to make key management decisions.
  - A1.5 Analyze physical production relationships to determine optimum use levels.
  - A1.6 Understand how to calculate the fixed and variable costs associated with the production of agricultural products and determine the output level that will yield maximum profit.
- 

*A2.0 Students understand the fundamental economic principles of agribusiness and agricultural production:*

- A2.1 Understand how basic economic factors affect agricultural production and agribusiness management decisions.
  - A2.2 Know basic agricultural economic terminology.
  - A2.3 Understand the law of supply and demand as it effects price determination.
  - A2.4 Analyze how agriculture uses scarce resources to meet the needs and demands of its consumers.
  - A2.5 Differentiate between elastic and inelastic supply and demand.
  - A2.6 Understand the law of diminishing returns and its impact on agricultural production.
- 

*A3.0 Students understand the role of credit in agribusiness and agricultural production:*

- A3.1 Analyze the factors that determine the cost of credit in order to select optimum credit sources (e.g., the advantages and disadvantages of borrowing from the various types of credit providers and sources for short-, intermediate-, and long-term credit).
- A3.2 Know the criteria lenders use to evaluate repayment capacity.
- A3.3 Analyze balance sheets and cash-flow statements to determine the ability to repay loans.

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*A4.0 Students understand proper accounting principles and procedures used in business management and tax planning:*

- A4.1 Understand the differences between cash and accrual accounting systems.
- A4.2 Understand the use and importance of budgets, income statements, balance sheets, and financial statements.
- A4.3 Understand the basis of taxation within the tax system and its impact on the economy, including the role of taxes in agribusiness.
- A4.4 Analyze the role of depreciation and purchasing in tax planning and liability.
- A4.5 Understand how to determine property values and how to complete a depreciation schedule.
- A4.6 Understand how to determine the tax obligations for an agribusiness.

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*A5.0 Students understand basic risk management principles and their impact on economic viability:*

- A5.1 Understand environmental responsibility and its impact on agribusiness.
- A5.2 Understand the concept of liability and the economic impact of being held liable.
- A5.3 Understand the concept and process of risk management, including the use of risk management tools such as insurance.
- A5.4 Understand how recordkeeping, farm plans, and an analysis of best practices affect risk management decisions.
- A5.5 Understand the role of contingency plans in risk management.

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*A6.0 Students understand the role and value of agricultural organizations:*

- A6.1 Understand the benefits of private, public, and governmental organizations, including the value and impact of cooperatives.
- A6.2 Understand how participation within organizations would be beneficial in supporting various agricultural operations.
- A6.3 Understand how to identify and electronically access public and private agricultural organizations.

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*A7.0 Students understand agricultural marketing systems:*

- A7.1 Understand how marketing functions in a free market society.
- A7.2 Understand the advantages and disadvantages of the various marketing options for agricultural products and services.
- A7.3 Understand how the law of comparative advantage affects agricultural production.
- A7.4 Understand the impact of advertising and promotion on the marketing of agricultural products and services.
- A7.5 Understand how promotion trends for agricultural products influence individuals.
- A7.6 Understand how to develop a marketing plan for an agricultural product or service.

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*A8.0 Students understand the sales of agricultural products and services:*

- A8.1 Determine the most effective methods for assessing customer needs and wants.
- A8.2 Understand the stages in making a successful sale and the various techniques used to approach potential customers and overcome their objections.
- A8.3 Examine the physiological and psychological factors that influence motivation to purchase, including the fundamental steps in making a purchase.

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*A9.0 Students understand local, national, and international agricultural markets and how trade affects the economy:*

- A9.1 Understand how the importance of agricultural imports and exports affects state and national economies.
- A9.2 Know how governmental, economic, and cultural factors affect international trade.
- A9.3 Compare and contrast United States trade policies with those of other important trading partners.
- A9.4 Understand how biotechnology affects trade and global economies.
- A9.5 Understand how different cultural values affect agricultural production and marketing.
- A9.6 Understand how negotiations and bargaining agreements affect trade agreements.
- A9.7 Analyze agricultural marketing strategies in other parts of the world.



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## B. Agricultural Mechanics Pathway

The Agricultural Mechanics Pathway prepares students for careers related to the construction, operation, and maintenance of equipment used by the agriculture industry. Basic agricultural mechanics skills and safety, standards B1.0 through B8.0, cover wood-working, electrical systems, plumbing, cold metal work, concrete, and welding technology. Advanced topics, standards B9.0 through B12.0, deal with metal fabrication, small engines, agriculture power and technology, and agriculture construction.

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*B1.0 Students understand personal and group safety:*

- B1.1 Practice the rules for personal and group safety while working in an agricultural mechanics environment.
  - B1.2 Know the relationship between accepted shop management procedures and a safe working environment.
  - B1.3 Know how to safely secure loads on a variety of vehicles.
- 

*B2.0 Students understand the principles of basic woodworking:*

- B2.1 Know how to identify common wood products, lumber types, and sizes.
  - B2.2 Know how to calculate board feet, lumber volume, and square feet.
  - B2.3 Know how to identify, select, and implement basic fastening systems.
  - B2.4 Complete a woodworking project, including interpreting a plan, developing a bill of materials and cutting list, selecting materials, shaping, joining, and finishing.
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*B3.0 Students understand the basic electricity principles and wiring practices commonly used in agriculture:*

- B3.1 Understand the relationship between voltage, amperage, resistance, and power in single-phase alternating current (AC) circuits.
  - B3.2 Know how to use proper electrical test equipment for AC and direct current (DC).
  - B3.3 Analyze and correct basic circuit problems (e.g., open circuits, short circuits, incorrect grounding).
  - B3.4 Understand proper basic electrical circuit and wiring techniques with nonmetallic cable and conduit as defined by the National Electric Code.
  - B3.5 Interpret basic agricultural electrical plans.
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*B4.0 Students understand plumbing system practices commonly used in agriculture:*

- B4.1 Know basic plumbing fitting skills with a variety of materials, such as copper, PVC (polyvinyl chloride), steel, polyethylene, and ABS (acrylonitrile butadiene styrene).
- B4.2 Understand the environmental influences on plumbing system choices (e.g., filter systems, water disposal).

- B4.3 Know how various plumbing and irrigation systems are used in agriculture.
- B4.4 Complete a plumbing project, including interpreting a plan, developing a bill of materials and cutting list, selecting materials, joining, and testing.

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*B5.0 Students understand agricultural cold metal processes:*

- B5.1 Know how to identify common metals, sizes, and shapes.
- B5.2 Know basic tool-fitting skills.
- B5.3 Know layout skills.
- B5.4 Know basic cold metal processes (e.g., shearing, cutting, drilling, threading, bending.).
- B5.5 Complete a cold metal project, including interpreting a plan, developing a bill of materials, selecting materials, shaping, fastening, and finishing.

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*B6.0 Students understand concrete and masonry practices commonly used in agriculture:*

- B6.1 Understand how to accurately calculate volume, materials needed, and project costs for a concrete or masonry project.
- B6.2 Know proper bed preparation, concrete forms layout, and construction.
- B6.3 Complete a concrete or masonry project, including developing a bill of materials, assembling, mixing, placing, and finishing.

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*B7.0 Students understand oxy-fuel cutting and welding:*

- B7.1 Understand the role of heat and oxidation in the cutting process.
- B7.2 Know how to properly set up, adjust, shut down, and maintain an oxy-fuel system.
- B7.3 Know how to flame-cut metal with an oxy-fuel cutting torch.
- B7.4 Know how to fusion-weld mild steel with and without filler rod by using oxy-fuel equipment.
- B7.5 Know basic repair skills using a variety of techniques, such as brazing or hard surfacing.

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*B8.0 Students understand electric arc welding processes:*

- B8.1 Know how to select, properly adjust, safely employ, and maintain appropriate welding equipment (e.g., gas metal arc welding, shielded metal arc welding, gas tungsten arc welding).
- B8.2 Apply gas metal arc welding, shielded metal arc welding, or flux core arc welding processes to fusion-weld mild steel with appropriate welding electrodes and related equipment.
- B8.3 Weld a variety of joints in various positions.
- B8.4 Know how to read welding symbols and plans, select electrodes, fit-up joints, and control heat and distortion.

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*B9.0 Students understand advanced metallurgy principles and fabrication techniques:*

- B9.1 Understand metallurgy principles, including distortion, hardening, tempering, and annealing.
- B9.2 Operate and maintain various arc welding and cutting systems safely and appropriately.
- B9.3 Operate and maintain fabrication tools and equipment safely and appropriately.
- B9.4 Understand how to design project plans by using mechanical drawing techniques.
- B9.5 Understand how to finish a metal project by implementing proper sequencing.
- B9.6 Know how to manipulate and finish metal by using a variety of machines and techniques (e.g., lathe, mill, CNC plasma, shears, press break).
- B9.7 Construct a welding project (using any electric welding process, appropriate products, joints, and positions), including interpreting a plan, developing a bill of materials, selecting materials, and developing a clear and concise fabrication contract.

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*B10.0 Students understand small and compact engines:*

- B10.1 Understand engine theory for both two- and four-stroke cycle engines.
- B10.2 Know different types of small engines and their applications.
- B10.3 Know small engine parts and explain the various systems (e.g., fuel, ignition, compression, cooling, lubrication systems).
- B10.4 Know how to troubleshoot and solve problems with small engines.
- B10.5 Know how to disassemble, inspect, adjust, and reassemble a small engine.
- B10.6 Know how to look up parts, apply repair and maintenance recommendations from a repair manual, and complete appropriate forms, including work orders.

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*B11.0 Students understand the principles and applications of various engines and machinery used in agriculture:*

- B11.1 Understand how to identify common agricultural machinery.
- B11.2 Operate and maintain equipment safely and efficiently.
- B11.3 Know the various types of engines found on agricultural machinery and understand the theory and safe operation of their systems (e.g., cooling, electrical, fuel).
- B11.4 Know the theory and operation of mobile hydraulic systems and power take-off systems.
- B11.5 Troubleshoot common problems with engines and agricultural equipment.
- B11.6 Understand the theory and operation of 12-volt DC electronic and electrical systems (e.g., circuit design, starting, charging, and safety circuits).

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*B12.0 Students understand land measurement and construction techniques commonly used in agriculture:*

- B12.1 Understand common surveying techniques used in agriculture (e.g., leveling, land measurement, building layout).
- B12.2 Know how to draw and interpret architectural plans.
- B12.3 Know how to install single- and three-phase wiring and control systems found in agricultural structures, pumps, and irrigation systems.
- B12.4 Install plumbing in agricultural structures (e.g., potable water, sewer, irrigation).
- B12.5 Form, place, and finish concrete or masonry (e.g., concrete block).
- B12.6 Understand how to construct agricultural structures by using wood framing and steel framing systems (e.g., barns, shops, greenhouses, animal structures).
- B12.7 Develop clear and concise agricultural construction contracts.

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## C. Agriscience Pathway

The Agriscience Pathway helps students acquire a broad understanding of a variety of agricultural areas, develop an awareness of the many career opportunities in agriculture, participate in occupationally relevant experiences, and work cooperatively with a group to develop and expand leadership abilities. Students study California agriculture, agricultural business, agricultural technologies, natural resources, and animal, plant, and soil sciences.

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*C1.0 Students understand the role of agriculture in the California economy:*

- C1.1 Understand the history of the agricultural industry in California.
  - C1.2 Understand how California agriculture affects the quality of life.
  - C1.3 Understand the interrelationship of California agriculture and society at the local, state, national, and international levels.
  - C1.4 Understand the economic impact of leading California agricultural commodities.
  - C1.5 Understand the economic impact of major natural resources in California.
  - C1.6 Know the economic importance of major agricultural exports and imports.
- 

*C2.0 Students understand the interrelationship between agriculture and the environment:*

- C2.1 Understand important agricultural environmental impacts on soil, water, and air.
  - C2.2 Understand current agricultural environmental challenges.
  - C2.3 Understand how natural resources are used in agriculture.
  - C2.4 Compare and contrast practices for conserving renewable and nonrenewable resources.
  - C2.5 Understand how new energy sources are developed from agricultural products (e.g., gas-cogeneration and ethanol).
- 

*C3.0 Students understand the effects of technology on agriculture:*

- C3.1 Understand how an agricultural commodity moves from producer to consumer.
  - C3.2 Understand how technology influences factors such as labor, efficiency, diversity, availability, mechanization, communication, and so forth.
  - C3.3 Understand public concern for technological advancements in agriculture, such as genetically modified organisms.
  - C3.4 Understand the laws and regulations concerning biotechnology.
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*C4.0 Students understand the importance of animals, the domestication of animals, and the role of animals in modern society:*

- C4.1 Understand the evolution and roles of domesticated animals in society.
- C4.2 Know the differences between domestication and natural selection.
- C4.3 Understand the modern-day uses of animals and animal by-products.

- C4.4 Understand various points of view regarding the use of animals.
- C4.5 Understand unique and alternative uses of animals (e.g., Handi-Riders and companion animals).

*C5.0 Students understand the cell structure and function of plants and animals:*

- C5.1 Understand the purpose and anatomy of cells.
- C5.2 Know how cell parts function.
- C5.3 Understand various cell actions, such as osmosis and cell division.
- C5.4 Understand how plant and animal cells are alike and different.

*C6.0 Students understand animal anatomy and systems:*

- C6.1 Know the names and locations of the external anatomy of animals.
- C6.2 Know the anatomy and major functions of vertebrate systems, including digestive, reproductive, circulatory, nervous, muscular, skeletal, respiratory, and endocrine systems.

*C7.0 Students understand basic animal genetics:*

- C7.1 Differentiate between genotype and phenotype, and describe how dominant and recessive genes function.
- C7.2 Compare genetic characteristics among cattle, sheep, swine, and horse breeds.
- C7.3 Understand how to display phenotype and genotype ratios (e.g., by using a Punnett Square).
- C7.4 Understand the fertilization process.
- C7.5 Understand the purpose and processes of mitosis and meiosis.

*C8.0 Students understand fundamental animal nutrition and feeding:*

- C8.1 Know types of nutrients required by farm animals (e.g., proteins, minerals, vitamins, carbohydrates, fats/oils, water).
- C8.2 Analyze suitable common feed ingredients, including forages, roughages, concentrates, and supplements, for ruminant, monogastric, equine, and avian digestive systems.
- C8.3 Understand basic animal feeding guidelines and evaluate sample feeding programs for various species, including space requirements and economic considerations.

*C9.0 Students understand basic animal health:*

- C9.1 Assess the appearance and behavior of a normal, healthy animal.
- C9.2 Understand the ways in which housing, sanitation, and nutrition influence animal health and behavior.
- C9.3 Understand the causes and control of common animal diseases.

- C9.4 Understand how to control parasites and why.
- 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.

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*C10.0 Students understand soil science principles:*

- C10.1 Recognize the major soil components and types.
- C10.2 Understand how soil texture, structure, pH, and salinity affect plant growth.
- C10.3 Understand water delivery and irrigation system options.
- C10.4 Understand the types, uses, and applications of amendments and fertilizers.

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*C11.0 Students understand plant growth and development:*

- C11.1 Understand the anatomy and functions of plant systems and structures.
- C11.2 Understand plant growth requirements.
- C11.3 Know annual, biennial, and perennial life cycles.
- C11.4 Examine plant sexual and asexual reproduction.
- C11.5 Understand the photosynthesis process and the roles of the sun, chlorophyll, sugar, oxygen, carbon dioxide, and water in the process.
- C11.6 Understand the respiration process in the breakdown of food and organic matter.

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*C12.0 Students understand fundamental pest management:*

- C12.1 Understand the major classifications of pests (e.g., insects, weeds, disease, vertebrate pests).
- C12.2 Understand chemical, mechanical, cultural, and biological methods of plant pest control.
- C12.3 Understand the major principles, advantages, and disadvantages of integrated pest management.

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*C13.0 Students understand the scientific method:*

- C13.1 Understand the steps of the scientific method.
- C13.2 Analyze an animal or plant problem and devise a solution based on the scientific method.
- C13.3 Use the scientific method to conduct agricultural experiments.

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## D. Animal Science Pathway

In the Animal Science Pathway, students study large, small, and specialty animals. Students explore the necessary elements—such as diet, genetics, habitat, and behavior—to create humane, ecologically and economically sustainable animal production systems. The pathway includes the study of animal anatomy and physiology, nutrition, reproduction, genetics, health and welfare, animal production, technology, and the management and processing of animal products and by-products.

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*D1.0 Students understand the necessary elements for proper animal housing and animal-handling equipment:*

- D1.1 Understand appropriate space and location requirements for habitat, housing, feed, and water.
  - D1.2 Understand how to select habitat and housing conditions and materials (such as indoor and outdoor housing, fencing materials, air flow /ventilation, and shelters) to meet the needs of various animal species.
  - D1.3 Understand the purpose and the safe and humane use of restraint equipment, such as squeeze chutes, halters, and twitches.
  - D1.4 Understand the purpose and the safe and humane use of animal husbandry tools, such as hoof trimmers, electric shears, elastrators, dehorning tools, and scales.
- 

*D2.0 Students understand key principles of animal nutrition:*

- D2.1 Understand the flow of nutrients from the soil, through the animal, and back to the soil.
  - D2.2 Understand the principles for providing proper balanced rations for a variety of production stages in ruminants and monogastrics.
  - D2.3 Understand the digestive processes of the ruminant, monogastric, avian, and equine digestive systems.
  - D2.4 Understand how animal nutrition is affected by the digestive, endocrine, and circulatory systems.
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*D3.0 Students understand animal physiology:*

- D3.1 Understand the major physiological systems and the function of the organs within each system.
- D3.2 Understand the animal management practices that are likely to improve the functioning of the various physiological systems.



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*D4.0 Students understand animal reproduction, including the function of reproductive organs:*

- D4.1 Understand animal conception (including estrus cycles, ovulation, and insemination).
- D4.2 Understand the gestation process and basic fetal development.
- D4.3 Understand the parturition process, including the identification of potential problems and their solutions.
- D4.4 Understand the role of artificial insemination and embryo transfer in animal agriculture.
- D4.5 Understand commonly used animal production breeding systems (e.g., purebred compared with crossbred) and reasons for their use.

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*D5.0 Students understand animal inheritance and selection principles, including the structure and role of DNA:*

- D5.1 Evaluate a group of animals for desired qualities and discern among them for breeding selection.
- D5.2 Understand how to use animal performance data in the selection and management of production animals.
- D5.3 Research and discuss current technology used to measure desirable traits.
- D5.4 Understand how to predict phenotypic and genotypic results of a dominant and recessive gene pair.
- D5.5 Understand the role of mutations (both naturally occurring and artificially induced) and hybrids in animal genetics.

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*D6.0 Students understand the causes and effects of diseases and illnesses in animals:*

- D6.1 Understand the signs of normal health in contrast to illness and disease.
- D6.2 Understand the importance of animal behavior in diagnosing animal sickness and disease.
- D6.3 Understand the common pathogens, vectors, and hosts that cause disease in animals.
- D6.4 Understand prevention, control, and treatment practices related to pests and parasites.
- D6.5 Apply quality assurance practices to the proper administration of medicines and animal handling.
- D6.6 Understand how diseases are passed among animal species and from animals to humans and how that relationship affects health and food safety.
- D6.7 Understand the impacts on local, national, and global economies as well as on consumers and producers when animal diseases are not appropriately contained and eradicated.

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*D7.0 Students understand common rangeland management practices and their impact on a balanced ecosystem:*

- D7.1 Understand the role of rangeland use in an effective animal production program.
- D7.2 Know how rangeland management practices affect pasture production, erosion control, and the general balance of the ecosystem.
- D7.3 Understand how to manage rangelands (including how to calculate carrying capacity) for a variety of animal species and locations.
- D7.4 Understand how to balance rangeland use for animal grazing and for wildlife habitat.

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*D8.0 Students understand the challenges associated with animal waste management:*

- D8.1 Understand animal waste treatment and disposal management systems.
- D8.2 Understand various methods for using animal waste and their environmental impacts.
- D8.3 Understand the health and safety regulations that are an integral part of properly managed animal waste systems.

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*D9.0 Students understand animal welfare concerns and management practices that support animal welfare:*

- D9.1 Know the early warning signs of animal distress and how to rectify the problem.
- D9.2 Understand public concerns for animal welfare in the context of housing, behavior, nutrition, transportation, disposal, and harvest of animals.
- D9.3 Understand federal and state animal welfare laws and regulations, such as those dealing with abandoned and neglected animals, animal fighting, euthanasia, and medical research.
- D9.4 Understand the regulations for humane transport and harvest of animals, such as those delineated by the U.S. Department of Agriculture, Food Safety and Inspection Service, and the Humane Methods of Slaughter Act.

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*D10.0 Students understand the production of large animals (e.g., cattle, horses, swine, sheep, goats) and small animals (e.g., poultry, cavy, rabbits):*

- D10.1 Know how to synthesize and implement optimum requirements for diet, genetics, habitat, and behavior in the production of large and small animals.
- D10.2 Understand how to develop, maintain, and use growth and management records for large or small animals.

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*D11.0 Students understand the production of specialty animals (e.g., fish, marine animals, llamas, tall flightless birds):*

- D11.1 Understand the specialty animal's role in agriculture (e.g., fish farms, pack animals, working dogs).
- D11.2 Understand the unique nutrition, health, and habitat requirements for specialty animals.
- D11.3 Know how to synthesize and implement optimum requirements for diet, genetics, habitat, and behavior in the production of specialty animals.
- D11.4 Understand how to develop, maintain, and use growth and management records for specialty animals.

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*D12.0 Students understand how animal products and by-products are processed and marketed:*

- D12.1 Understand animal harvest, carcass inspection and grading, and meat processing safety regulations and practices and the removal and disposal of nonedible by-products, such as those outlined in Hazard Analysis and Critical Control Point documents.
- D12.2 Understand the relative importance of the major meat classifications, including the per capita consumption and nutritive value of those classifications.
- D12.3 Understand how meat-based products and meals are made.
- D12.4 Understand how nonmeat products (such as eggs, wool, pelts, hides, and by-products) are harvested and processed.
- D12.5 Understand how meat products and nonmeat products are marketed.
- D12.6 Understand the value of animal by-products to nonagricultural industries.

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## E. Forestry and Natural Resources Pathway

The Forestry and Natural Resources Pathway helps students understand the relationships between California's natural resources and the environment. Topics include energy and nutrient cycles, water resources and management, soil conservation, wild-life preservation and management, forest and fire management, and lumber production. In addition, students study the outdoor recreation industry and multiple-use management.

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*E1.0 Students understand the importance of energy and energy cycles:*

- E1.1 Understand the oxygen, carbon, nitrogen, and water cycles.
  - E1.2 Understand the difference between renewable and nonrenewable energy sources.
  - E1.3 Understand the difference between natural resource management conservation strategies and preservation strategies.
  - E1.4 Compare the effects on air and water quality of using different forms of energy.
  - E1.5 Analyze the way in which human activities influence energy cycles and natural resource management.
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*E2.0 Students understand air and water use, management practices, and conservation strategies:*

- E2.1 Understand the government's role in regulating air, soil, and water use management practices and conservation strategies.
  - E2.2 Understand air and water conservation issues.
  - E2.3 Understand appropriate water conservation measures.
  - E2.4 Understand the component of a plan that monitors water quality.
  - E2.5 Understand the component of a plan that monitors air quality.
  - E2.6 Analyze the way in which water management affects the environment and human needs.
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*E3.0 Students understand soil composition and soil management:*

- E3.1 Understand the systems used to classify soils.
- E3.2 Understand the reasons for and importance of soil conservation.
- E3.3 Understand how to analyze soils found in the different natural resource management areas.
- E3.4 Understand how to develop and implement a soil management plan for a natural resource management area.
- E3.5 Understand how to analyze existing soil surveys to develop effective management plans.

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*E4.0 Students understand rangeland management:*

- E4.1 Know the locations of major U.S. and California rangeland areas.
- E4.2 Understand the interrelationship of rangeland management, the environment, wildlife management, and the livestock industry.
- E4.3 Understand practices used to improve rangeland quality.
- E4.4 Analyze the carrying capacity in various rangelands for both wildlife species and domestic livestock.
- E4.5 Distinguish among different browse and forage species in California rangelands.
- E4.6 Understand the components of a rangeland monitoring plan.
- E4.7 Understand the requirements and rights accompanying public land grazing permits and the government agencies involved (e.g., Bureau of Land Management and U.S. Forest Service).

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*E5.0 Students understand wildlife management and habitat:*

- E5.1 Understand the relationship between habitat and wildlife population.
- E5.2 Understand habitat requirements for different species and identify factors that influence population dynamics.
- E5.3 Understand the methods for determining existing wildlife species populations.
- E5.4 Understand mammalian and avian reproductive processes and explain how nutrition and habitat affect reproduction and population.
- E5.5 Understand a variety of management practices used to manage wildlife populations for hunting and other recreational purposes.
- E5.6 Analyze the economic and environmental significance of sport hunting and fishing industries.
- E5.7 Understand the purpose, history, terminology, and challenges of the Endangered Species Act and current activities related to the Act.

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*E6.0 Students understand aquatic resource use and management:*

- E6.1 Understand the different types of aquatic resources.
- E6.2 Know the major body parts, digestive systems, and reproductive organs of aquatic species.
- E6.3 Understand a variety of methods to determine the populations of existing aquatic species.
- E6.4 Analyze the relationship between water quality and aquatic species habitat.
- E6.5 Understand a variety of management practices for managing aquatic species for sport fishing and other purposes.
- E6.6 Understand how to make financial and production decisions and maintain growth and management records for a selected aquatic species.

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*E7.0 Students understand the outdoor recreation industry:*

- E7.1 Understand the potential environmental impacts of recreational activities and how to manage the resources affected.
- E7.2 Understand basic survival skills and first-aid procedures.
- E7.3 Understand appropriate trail construction and maintenance techniques.
- E7.4 Understand how to select appropriate recreational gear for trips of varying types and durations and how to use it safely and appropriately (for minimum environmental impact).
- E7.5 Know how to set up a campsite for minimum environmental impact.

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*E8.0 Students understand basic plant physiology, anatomy, and taxonomy:*

- E8.1 Understand the scientific method of animal classification, including order, family, genus, and species.
- E8.2 Know how to use a dichotomous key to identify plants and animals.
- E8.3 Know how to identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
- E8.4 Recognize the factors that influence plant growth, such as respiration, temperature, nutrients, and photosynthesis.

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*E9.0 Students understand the role of fire in natural resource management:*

- E9.1 Understand the role of fire in forest and rangeland ecosystems.
- E9.2 Understand the significance of each of the components of the “fire triangle.”
- E9.3 Know appropriate wildland fire-suppression practices.
- E9.4 Understand the components of a fire-control plan.
- E9.5 Know how to use fire-control tools safely.
- E9.6 Know the training requirements for fire-suppression certification.

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*E10.0 Students understand forest management practices:*

- E10.1 Understand how social, political, and economic factors can affect the use of forests.
- E10.2 Understand the California Forest Practice Act and the requirements for Timber Harvest and Habitat Conservation Plans.
- E10.3 Analyze forest management systems (e.g., sustained yield, watershed management, ecosystem management, multiple-use management).
- E10.4 Analyze harvest and renewability (e.g., re-seeding and thinning) systems and identify the impact of each on the land.
- E10.5 Understand Silvicultural systems and skills, including appropriate tool use.
- E10.6 Understand how to identify and diagnose damage from destructive insects, diseases, and weather, and know methods for their management.

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*E11.0 Students understand the basic concepts of measurement, surveying, and mapping:*

- E11.1 Understand the Public Land Survey System.
- E11.2 Use surveying equipment, including global positioning satellites, maps, and a compass to determine area, boundaries, and elevation differences.
- E11.3 Know how to apply timber-cruising and log-scaling skills to determine timber and log volume for management and marketing.
- E11.4 Understand how to create a management plan map that includes layer information and data points from global information systems.

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*E12.0 Students understand the use, processing, and marketing of products from natural resource industries:*

- E12.1 Know the marketing processes and manufacturing standards for a variety of natural resource products, including mining, quarrying, and drilling.
- E12.2 Know how to manufacture a product (to manufacturing standards) from a natural resource.
- E12.3 Analyze the production of specialty and seasonal products from natural resources.
- E12.4 Know different wood types and their uses.
- E12.5 Know lumber manufacturing processes.

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*E13.0 Students understand public and private land issues:*

- E13.1 Understand the differences between publicly and privately held lands.
- E13.2 Understand the differences between public land designations (e.g., State Park, National Forest, wilderness areas, wild and scenic areas).
- E13.3 Understand the role of public and private property rights and how they affect agriculture.
- E13.4 Understand the role of government in managing public and private property rights.

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## F. Ornamental Horticulture Pathway

The Ornamental Horticulture Pathway prepares students for careers in the nursery, landscaping, and floral industries. Topics include plant identification, plant physiology, soil science, plant reproduction, nursery production, and floriculture as well as landscaping design, installation, and maintenance.

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*F1.0 Students understand plant classification and use principles:*

- F1.1 Understand how to classify and identify plants by order, family, genus, and species.
  - F1.2 Understand how to identify plants by using a dichotomous key.
  - F1.3 Understand how common plant parts are used to classify the plants.
  - F1.4 Understand how to classify and identify plants by using botanical growth habits, landscape uses, and cultural requirements.
  - F1.5 Understand plant selection and identification for local landscape applications.
- 

*F2.0 Students understand plant physiology and growth principles:*

- F2.1 Understand plant systems, nutrient transportation, structure, and energy storage.
  - F2.2 Understand the seed's essential parts and functions.
  - F2.3 Understand how primary, secondary, and trace elements are used in plant growth.
  - F2.4 Understand the factors that influence plant growth, including water, nutrients, light, soil, air, and climate.
  - F2.5 Understand the tissues seen in a cross section of woody and herbaceous plants.
  - F2.6 Understand the factors that affect plant growth.
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*F3.0 Students understand sexual and asexual plant reproduction:*

- F3.1 Understand the different forms of sexual and asexual plant reproduction.
  - F3.2 Understand the various techniques for successful plant propagation (e.g., budding, grafting, cuttings, seeds).
  - F3.3 Understand how to monitor plant reproduction for the development of a saleable product.
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*F4.0 Students understand basic integrated pest management principles:*

- F4.1 Read and interpret pesticide labels and understand safe pesticide management practices.
- F4.2 Understand how pesticide regulations and government agencies affect agriculture.
- F4.3 Understand common horticultural pests and diseases and methods of controlling them.
- F4.4 Understand the systematic approach to solving plant problems.



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*F5.0 Students understand water and soil (media) management practices:*

- F5.1 Understand how basic soil science and water principles affect plant growth.
- F5.2 Know basic irrigation design and installation methods.
- F5.3 Prepare and amend soils, implement soil conservation methods, and compare results.
- F5.4 Understand major issues related to water sources and water quality.
- F5.5 Know the components of soilless media and the use of those media in various types of containers.

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*F6.0 Students understand ornamental plant nutrition practices:*

- F6.1 Analyze how primary and secondary nutrients and trace elements affect ornamental plants.
- F6.2 Understand basic nutrient testing procedures on soil and plant tissue.
- F6.3 Analyze organic and inorganic fertilizers to understand their appropriate uses.
- F6.4 Understand how to read and interpret labels to properly apply fertilizers.

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*F7.0 Students understand the selection, installation, and maintenance of turf:*

- F7.1 Understand the selection and management of landscape and sports field turf.
- F7.2 Understand how to select, install, and maintain a designated turfgrass area.
- F7.3 Understand how the use of turf benefits the environment.

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*F8.0 Students understand nursery production principles:*

- F8.1 Understand how to properly use production facilities and common nursery equipment.
- F8.2 Understand common nursery production practices.
- F8.3 Understand how to propagate and maintain a horticultural crop to the point of sale.
- F8.4 Understand marketing and merchandising principles used in nursery production.

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*F9.0 Students understand the use of containers and horticultural tools, equipment, and facilities:*

- F9.1 Understand the use of different types of containers and demonstrate how to maintain growing containers in controlled environments.
- F9.2 Operate and maintain selected hand and power equipment safely and appropriately.
- F9.3 Select proper tools for specific horticultural jobs.
- F9.4 Understand how to install landscape components and electrical land and water features.

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*F10.0 Students understand basic landscape planning, design, construction, and maintenance:*

- F10.1 Know the terms associated with landscape and design and their appropriate use.
- F10.2 Understand the principles of residential design, including how to render design to scale.
- F10.3 Understand proper landscape planting and maintenance practices.
- F10.4 Prune ornamental shrubs, trees, and fruit trees.
- F10.5 Develop clear and concise landscape business contracts.

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*F11.0 Students understand basic floral design principles:*

- F11.1 Understand the use of plant materials and tools.
- F11.2 Apply basic design principles to products and designs.
- F11.3 Handle, prepare, and arrange cut flowers appropriately.
- F11.4 Understand marketing and merchandising principles used in the floral industry.

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## G. Plant and Soil Science Pathway

The Plant and Soil Science Pathway covers topics such as plant classification, physiology, reproduction, plant breeding, biotechnology, and pathology. In addition, students learn about soil management, water, pests, and equipment as well as cultural and harvest practices.

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### G1.0 *Students understand plant classification principles:*

- G1.1 Understand how to classify and identify plants by order, family, genus, and species.
- G1.2 Understand how to identify plants by using a dichotomous key.
- G1.3 Understand how common plant parts are used to classify the plants.
- G1.4 Understand the differences between and uses of native and nonnative plants.
- G1.5 Understand the differences between monocots and dicots.
- G1.6 Understand the differences between plants under production and weeds.

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### G2.0 *Students understand cell biology:*

- G2.1 Understand the differences between prokaryotic cells and plant and animal eukaryotic cells and how viruses differ from them in complexity and general structure.
- G2.2 Understand plant cellular function reactions when plants are grown under different conditions.
- G2.3 Understand what functions organelles play in the health of the cell.
- G2.4 Understand the part of the cell that is responsible for the genetic information that controls plant growth and development.
- G2.5 Understand plant inheritance principles, including the structure and role of DNA.
- G2.6 Understand which organelles in plant cells carry out photosynthesis.

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### G3.0 *Students understand plant physiology and growth principles:*

- G3.1 Understand plant systems, nutrient transportation, structure, and energy storage.
- G3.2 Understand the seed's essential parts and functions.
- G3.3 Understand how primary, secondary, and trace elements are used in plant growth.
- G3.4 Understand the factors that influence plant growth, including water, nutrients, light, soil, air, and climate.
- G3.5 Understand the tissues seen in a cross section of woody and herbaceous plants.
- G3.6 Understand the factors that affect plant growth and predict plant response.

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*G4.0 Students understand sexual and asexual reproduction of plants:*

- G4.1 Understand the different forms of sexual and asexual plant reproduction.
- G4.2 Understand the various techniques for successful plant propagation (e.g., budding, grafting, cuttings, and seeds).
- G4.3 Understand the proper sterile technique used in tissue culture.

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*G5.0 Students understand pest problems and management:*

- G5.1 Understand how to categorize insects as pests, beneficial, or neutral and their roles.
- G5.2 Understand the role of other pests, such as nematodes, molds, mildews, and weeds.
- G5.3 Know conventional, sustainable, and organic management methods to prevent or treat plant disease symptoms.
- G5.4 Understand integrated pest management to prevent, treat, and control plant disease symptoms (including conventional, sustainable, and organic management methods).
- G5.5 Understand how biotechnology can be used to manage pests.

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*G6.0 Students understand soils and plant production:*

- G6.1 Understand soil types, soil texture, structure, and bulk density and explain the U.S. Department of Agriculture (USDA) soil-quality rating procedure.
- G6.2 Understand soil properties necessary for successful plant production, including pH, EC, and essential nutrients.
- G6.3 Understand soil biology and diagram the soil food chain.
- G6.4 Understand how soil biology affects the environment and natural resources.

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*G7.0 Students understand effective tillage and soil conservation management practices:*

- G7.1 Understand how to effectively manage and conserve soil through conventional, minimum, conservation, and no-tillage irrigation and through drainage and tillage practices.
- G7.2 Understand how global positioning systems, surveying, laser leveling, and other tillage practices conserve soil.
- G7.3 Use tools such as the USDA and the local Resource Conservation District soil survey maps to determine appropriate soil management practices.

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*G8.0 Students understand effective water management practices:*

- G8.1 Understand California water history, current issues, water rights, water law, and water transfer through different distribution projects throughout the state.
- G8.2 Understand the local, state, and federal agencies that regulate water quality and availability in California.

- G8.3 Understand the definition of a watershed and how it is used to measure water quality.
- G8.4 Understand effective water management and conservation practices, including the use of tailwater ponds.
- G8.5 Know water-testing standards and perform bioassay and macro-invertebrate protocols to assess water quality.

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*G9.0 Students understand the concept of an “agrosystem” approach to production:*

- G9.1 Understand how to identify and classify the plants and animals in an agricultural system (as producers, consumers, or decomposers).
- G9.2 Understand the elements of conventional, sustainable, and organic production systems.
- G9.3 Understand the components of “whole-system management.”

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*G10.0 Students understand local crop management and production practices:*

- G10.1 Understand local cultural techniques, including monitoring, pruning, fertilization, planting, irrigation, harvest treatments, processing, and packaging practices for various tree, grain, hay, and vegetable classes.
- G10.2 Understand common marketing and shipping characteristics of local commodities.
- G10.3 Understand general maturity and harvest-time guidelines for specific local plant products.

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*G11.0 Students understand plant biotechnology:*

- G11.1 Understand how changing technology—such as micropropagation, biological pest controls, and genetic engineering (including DNA extraction and gel electrophoresis)—affects plant production, yields, and management.
- G11.2 Understand the various technology advancements that affect plant and soil science (such as global positioning systems, global information systems, variable rate technology, and remote sensing).
- G11.3 Know how herbicide-resistant plant genes can affect the environment.
- G11.4 Understand how genetic engineering techniques have been used to improve crop yields.
- G11.5 Understand the effects of agricultural biotechnology, including genetically modified organisms, on the agriculture industry and the larger society and the pros and cons of such use.



# **Arts, Media, and Entertainment Industry Sector**

## *Career Pathways*

- ◆ Media and Design Arts
- ◆ Performing Arts
- ◆ Production and Managerial Arts



# Arts, Media, and Entertainment Industry Sector

Of all the career industries, the Arts, Media, and Entertainment sector requires perhaps the greatest cross-disciplinary interaction and development because the work in this sector has a propensity to be largely project-based, requiring uniquely independent work and self-management career skills. New technological developments are also constantly reshaping the boundaries and skill sets of many arts career pathways. Consequently, core arts sector occupations demand constantly varying combinations of artistic imagination, metaphoric representation, symbolic connections, and technical skills. Successful career preparation involves both in-depth and broad academic preparation as well as the cultivation of such intangible assets as flexibility, problem-solving abilities, and interpersonal skills. Careers in the Arts, Media, and Entertainment sector fall in three general pathways: Media and Design Arts, Performing Arts, and Production and Managerial Arts. The foundation and pathway standards make explicit the appropriate knowledge, skills, and practical experience students should have to pursue their chosen profession through whatever course of postsecondary, collegiate, and graduate training or apprenticeship it may require.

Learning the skills and knowledge for creating, refining, and exhibiting works of art promotes teamwork, communication, creative thinking, and decision-making abilities—all traits needed to function successfully in the competitive and media-rich twenty-first century. Through the manipulation of sight, sound, and motion, those choosing a pathway from this sector reach out in unique ways to enhance the quality of life for those around them.

## FOUNDATION STANDARDS

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### 1.0 Academics

Students understand the academic content required for entry into postsecondary education and employment in the Arts, Media, and Entertainment sector.

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, history–social science, and visual and performing arts content standards adopted by the State Board of Education.)*

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## 1.1 Mathematics

Specific applications of Number Sense standards (grade seven):

- (1.7) Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.
- (2.2) Add and subtract fractions by using factoring to find common denominators.
- (2.3) Multiply, divide, and simplify rational numbers by using exponent rules.

Specific applications of Measurement and Geometry standards (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).
- (1.2) Construct and read drawings and models made to scale.

Specific applications of Mathematical Reasoning standards (grade seven):

- (1.3) Determine when and how to break a problem into simpler parts.
- (3.1) Evaluate the reasonableness of the solution in the context of the original situation.

Specific applications of Algebra I standards (grades eight through twelve):

- (15.0) Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.
- (24.1) Students explain the difference between inductive and deductive reasoning and identify and provide examples of each.
- (24.2) Students identify the hypothesis and conclusion in logical deduction.
- (24.3) Students use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.
- (25.1) Students use properties of numbers to construct simple, valid arguments (direct and indirect) for, or formulate counterexamples to, claimed assertions.
- (25.2) Students judge the validity of an argument according to whether the properties of the real number system and the order of operations have been applied correctly at each step.
- (25.3) Given a specific algebraic statement involving linear, quadratic, or absolute value expressions or equations or inequalities, students determine whether the statement is true sometimes, always, or never.

Specific applications of Geometry standards (grades eight through twelve):

- (3.0) Students construct and judge the validity of a logical argument and give counterexamples to disprove a statement.

Specific applications of Probability and Statistics standards (grades eight through twelve):

- (3.0) Students demonstrate an understanding of the notion of *discrete random variables* by using them to solve for the probabilities of outcomes, such as the probability of the occurrence of five heads in 14 coin tosses.



- (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.

### 1.2 Science

Specific applications of Physics standards (grades nine through twelve):

- (4.d) Students know sound is a longitudinal wave whose speed depends on the properties of the medium in which it propagates.
- (4.e) Students know radio waves, light, and X-rays are different wavelength bands in the spectrum of electromagnetic waves whose speed in a vacuum is approximately  $3 \times 10^8$  m/s (186,000 miles/second).
- (4.f) Students know how to identify the characteristic properties of waves: interference (beats), diffraction, refraction, Doppler effect, and polarization.
- (5.c) Students know any resistive element in a DC circuit dissipates energy, which heats the resistor. Students can calculate the power (rate of energy dissipation) in any resistive circuit element by using the formula  $\text{Power} = IR$  (potential difference  $\times I$  (current) =  $I^2R$ ).
- (5.d) Students know the properties of transistors and the role of transistors in electric circuits.

Specific applications of Investigation and Experimentation standards (grades nine through twelve):

- (1.b) Identify and communicate sources of unavoidable experimental error.
- (1.c) Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.
- (1.d) Formulate explanations by using logic and evidence.
- (1.f) Distinguish between hypothesis and theory as scientific terms.
- (1.g) Recognize the usefulness and limitations of models and theories as scientific representations of reality.
- (1.1) Analyze situations and solve problems that require combining and applying concepts from more than one area of science.

### 1.3 History–Social Science

Specific applications of Chronological and Spatial Thinking standards (grades nine through twelve):

- (2) Students analyze how change happens at different rates at different times; understand that some aspects can change while others remain the same; and understand that change is complicated and affects not only technology and politics but also values and beliefs.

Specific applications of Historical Research, Evidence, and Point of View standards (grades nine through twelve):

- (1) Students distinguish valid arguments from fallacious arguments in historical interpretations.

- (2) Students identify bias and prejudice in historical interpretations.
- (4) Students construct and test hypotheses; collect, evaluate, and employ information from multiple primary and secondary sources; and apply it in oral and written presentations.

Specific applications of Historical Interpretation standards (grades nine through twelve):

- (1) Students show the connections, causal and otherwise, between particular historical events and larger social, economic, and political trends and developments.
- (2) Students recognize the complexity of historical causes and effects, including the limitations on determining cause and effect.
- (3) Students interpret past events and issues within the context in which an event unfolded rather than solely in terms of present-day norms and values.
- (4) Students understand the meaning, implication, and impact of historical events and recognize that events could have taken other directions.

Specific applications of World History, Culture, and Geography: The Modern World standards (grade ten):

- (10.3.5) Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.
- (10.3.7) Describe the emergence of Romanticism in art and literature (e.g., the poetry of William Blake and William Wordsworth), social criticism (e.g., the novels of Charles Dickens), and the move away from Classicism in Europe.
- (10.6.4) Discuss the influence of World War I on literature, art, and intellectual life in the West (e.g., Pablo Picasso, the “lost generation” of Gertrude Stein, Ernest Hemingway).
- (10.11) Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (11.5) Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.
- (11.5.5) Describe the Harlem Renaissance and new trends in literature, music, and art, with special attention to the work of writers (e.g., Zora Neale Hurston, Langston Hughes).
- (11.5.6) Trace the growth and effects of radio and movies and their role in the worldwide diffusion of popular culture.
- (11.5.7) Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.
- (11.8.8) Discuss forms of popular culture, with emphasis on their origins and geographic diffusion (e.g., jazz and other forms of popular music, professional sports, architectural and artistic styles).

Specific applications of Principles of American Democracy standards (grade twelve):

- (12.8) Students evaluate and take and defend positions on the influence of the media on American political life.
- (12.8.2) Describe the roles of broadcast, print, and electronic media, including the Internet, as means of communication in American politics.
- (12.8.3) Explain how public officials use the media to communicate with the citizenry and to shape public opinion.

Specific applications of Principles of Economics standards (grade twelve):

- (12.2) Students analyze the elements of America’s market economy in a global setting.
- (12.2.1) Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.
- (12.2.4) Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.
- (12.2.5) Understand the process by which competition among buyers and sellers determines a market price.
- (12.2.7) Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.
- (12.2.8) Explain the role of profit as the incentive to entrepreneurs in a market economy.
- (12.3) Students analyze the influence of the federal government on the American economy.
- (12.4) Students analyze the elements of the U.S. labor market in a global setting.
- (12.4.1) 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.
- (12.4.3) Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.

#### 1.4 *Visual and Performing Arts*

Specific applications of Dance standards at the proficient level (grades nine through twelve):

- (4.1) Describe how the qualities of a theatrical production contribute to the success of a dance performance (e.g., music, lighting, costuming, text, set design).

Specific applications of Dance standards at the advanced level (grades nine through twelve):

- (5.3) Synthesize information from a variety of health-related resources to maintain physical and emotional health.

Specific applications of Music standards at the advanced level (grades nine through twelve):

- (5.1) Explain ways in which the principles and subject matter of music and various disciplines outside the arts are interrelated.

Specific applications of Theatre standards at the advanced level (grades nine through twelve):

- (4.2) Draw conclusions about the effectiveness of informal and formal productions, films/videos, or electronic media on the basis of intent, structure, and quality of the work.
- (5.3) Communicate creative, design, and directorial choices to ensemble members, using leadership skills, aesthetic judgment, or problem-solving skills.

Specific applications of Visual Arts standards at the advanced level (grades nine through twelve):

- (5.2) Compare and contrast works of art, probing beyond the obvious and identifying psychological content found in the symbols and images.
- (5.3) Prepare portfolios of their original works of art for a variety of purposes (e.g., review for postsecondary application, exhibition, job application, and personal collection).

## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English-language arts content standards adopted by the State Board of Education.)*

### 2.1 Reading

Specific applications of Literary Response and Analysis standards (grade eight):

- (3.2) Evaluate the structural elements of the plot (e.g., subplots, parallel episodes, climax), the plot's development, and the way in which conflicts are (or are not) addressed and resolved.

Specific applications of Reading Comprehension standards (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.
- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (2.3) Generate relevant questions about readings on issues that can be researched.
- (2.4) Synthesize the content from several sources or works by a single author dealing with a single issue; paraphrase the ideas and connect them to other sources and related topics to demonstrate comprehension.
- (2.5) Extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration.
- (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).

Specific applications of Reading standards (grades eleven and twelve):

- (1.1) Trace the etymology of significant terms used in political science and history.
- (1.2) Apply knowledge of Greek, Latin, and Anglo-Saxon roots and affixes to draw inferences concerning the meaning of scientific and mathematical terminology.
- (1.3) Discern the meaning of analogies encountered, analyzing specific comparisons as well as relationships and inferences
- (2.1) Analyze both the features and the rhetorical devices of different types of public documents (e.g., policy statements, speeches, debates, platforms) and the way in which authors use those features and devices.
- (2.2) Analyze the way in which clarity of meaning is affected by the patterns of organization, hierarchical structures, repetition of the main ideas, syntax, and word choice in the text.
- (2.3) Verify and clarify facts presented in other types of expository texts by using a variety of consumer, workplace, and public documents.
- (2.4) Make warranted and reasonable assertions about the author's arguments by using elements of the text to defend and clarify interpretations.
- (2.5) Analyze an author's implicit and explicit philosophical assumptions and beliefs about a subject.
- (2.6) Critique the power, validity, and truthfulness of arguments set forth in public documents; their appeal to both friendly and hostile audiences; and the extent to which the arguments anticipate and address reader concerns and counterclaims (e.g., appeal to reason, to authority, to pathos and emotion).
- (3.1) Analyze characteristics of subgenres (e.g., satire, parody, allegory, pastoral) that are used in poetry, prose, plays, novels, short stories, essays, and other basic genres.
- (3.2) Analyze the way in which the theme or meaning of a selection represents a view or comment on life, using textual evidence to support the claim.
- (3.3) Analyze the ways in which irony, tone, mood, the author's style, and the "sound" of language achieve specific rhetorical or aesthetic purposes or both.
- (3.4) Analyze ways in which poets use imagery, personification, figures of speech, and sounds to evoke readers' emotions.
- (3.5) Analyze recognized works of American literature representing a variety of genres and traditions:
  - a. Trace the development of American literature from the colonial period forward.
  - b. Contrast the major periods, themes, styles, and trends and describe how works by members of different cultures relate to one another in each period.
  - c. Evaluate the philosophical, political, religious, ethical, and social influences of the historical period that shaped the characters, plots, and settings.
- (3.6) Analyze the way in which authors through the centuries have used archetypes drawn from myth and tradition in literature, film, political speeches, and religious writings (e.g., how the archetypes of banishment from an ideal world may be used to interpret Shakespeare's tragedy *Macbeth*).

- (3.7) Analyze recognized works of world literature from a variety of authors:
  - a. Contrast the major literary forms, techniques, and characteristics of the major literary periods (e.g., Homeric Greece, medieval, romantic, neoclassic, modern).
  - b. Relate literary works and authors to the major themes and issues of their eras.
  - c. Evaluate the philosophical, political, religious, ethical, and social influences of the historical period that shaped the characters, plots, and settings.
- (3.8) Analyze the clarity and consistency of political assumptions in a selection of literary works or essays on a topic (e.g., suffrage, women’s role in organized labor). (Political approach)
- (3.9) Analyze the philosophical arguments presented in literary works to determine whether the authors’ positions have contributed to the quality of each work and the credibility of the characters. (Philosophical approach)

## 2.2 Writing

Specific applications of Writing Applications standards (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).

Specific applications of Writing Strategies and Applications standards (grades eleven and twelve):

- (1.1) Demonstrate an understanding of the elements of discourse (e.g., purpose, speaker, audience, form) when completing narrative, expository, persuasive, or descriptive writing assignments.
- (1.2) Use point of view, characterization, style (e.g., use of irony), and related elements for specific rhetorical and aesthetic purposes.
- (1.3) Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.
- (1.4) Enhance meaning by employing rhetorical devices, including the extended use of parallelism, repetition, and analogy; the incorporation of visual aids (e.g., graphs, tables, pictures); and the issuance of a call for action.
- (1.5) Use language in natural, fresh, and vivid ways to establish a specific tone.
- (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).
- (1.7) Use systematic strategies to organize and record information (e.g., anecdotal scripting, annotated bibliographies).
- (1.8) Integrate databases, graphics, and spreadsheets into word-processed documents.

- (1.9) Revise text to highlight the individual voice, improve sentence variety and style, and enhance subtlety of meaning and tone in ways that are consistent with the purpose, audience, and genre.
- (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.
- (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.

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### 2.3 *Written and Oral English Language Conventions*

Specific applications of English Language Conventions standards (grades eleven and twelve):

- (1.1) Demonstrate control of grammar, diction, and paragraph and sentence structure and an understanding of English usage.
- (1.2) Produce legible work that shows accurate spelling and correct punctuation and capitalization.
- (3.3) Reflect appropriate manuscript requirements in writing.

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### 2.4 *Listening and Speaking*

Specific applications of Listening and Speaking Strategies standards (grade seven):

- (1.8) Analyze the effect on the viewer of images, text, and sound in electronic journalism; identify the techniques used to achieve the effects in each instance studied.

Specific applications of Speaking Applications standards (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.

Specific applications of Listening and Speaking Strategies and Applications standards (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).
- (1.2) Analyze the impact of the media on the democratic process (e.g., exerting influence on elections, creating images of leaders, shaping attitudes) at the local, state, and national levels.
- (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).
- (1.4) Use rhetorical questions, parallel structure, concrete images, figurative language, characterization, irony, and dialogue to achieve clarity, force, and aesthetic effect.
- (1.5) Distinguish between and use various forms of classical and contemporary logical arguments, including:
  - a. Inductive and deductive reasoning
  - b. Syllogisms and analogies
- (1.6) Use logical, ethical, and emotional appeals that enhance a specific tone and purpose.
- (1.7) Use appropriate rehearsal strategies to pay attention to performance details, achieve command of the text, and create skillful artistic staging.
- (1.8) Use effective and interesting language, including:
  - a. Informal expressions for effect
  - b. Standard American English for clarity
  - c. Technical language for specificity
- (1.9) Use research and analysis to justify strategies for gesture, movement, and vocalization, including dialect, pronunciation, and enunciation.
- (1.10) Evaluate when to use different kinds of effects (e.g., visual, music, sound, graphics) to create effective productions.
- (1.11) Critique a speaker's diction and syntax in relation to the purpose of an oral communication and the impact the words may have on the audience.
- (1.12) Identify logical fallacies used in oral addresses (e.g., attack *ad hominem*, false causality, red herring, overgeneralization, bandwagon effect).
- (1.13) Analyze the four basic types of persuasive speech (i.e., propositions of fact, value, problem, or policy) and understand the similarities and differences in their patterns of organization and the use of persuasive language, reasoning, and proof.
- (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").



- (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.
- (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").

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### 3.0 Career Planning and Management

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

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, 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.
- 3.7 Understand the impact of the economic environment on the arts industry.
- 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.

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### 4.0 Technology

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

- 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.
- 4.4 Understand digital applications appropriate to specific media and projects.
- 4.5 Know the key technological skills appropriate for occupations in the arts industry.
- 4.6 Know how technology and the arts are interrelated in the development of presentations and productions.
- 4.7 Understand how technology can reinforce, enhance, or alter products and performances.

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## 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:

- 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.
- 5.4 Use the elements of the particular art form to observe, perceive, and respond.
- 5.5 Understand the application of research and analysis skills to the creation of content.

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## 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:

- 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.
- 6.3 Know how to take responsibility for a safe and healthy work environment.
- 6.4 Understand the lifestyle choices and physical preparation required to function and maintain work activities in the chosen field.
- 6.5 Understand the opportunities for and challenges to maintaining physical and emotional health.

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## 7.0 Responsibility and Flexibility

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

- 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.
- 7.5 Know the current issues and trends related to the field, distinguishing the different and convergent objectives that drive the industry.
- 7.6 Understand the value of flexibility in all aspects of the creative process (e.g., nonconforming ideas and concepts) and how flexibility influences business relationships (e.g., employer-client).
- 7.7 Develop a personal commitment to and apply high-quality craftsmanship to a product or presentation and continually refine and perfect it.

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## 8.0 Ethics and Legal Responsibilities

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

- 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.
- 8.4 Adhere to the copyright and intellectual property laws and regulations, and use and cite proprietary information appropriately.
- 8.5 Understand the ethical implications of the degree of influence media, arts, and performances have on individuals.
- 8.6 Understand liability and compliance issues relevant to the arts, media, and entertainment industries.

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## 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:

- 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.
- 9.6 Understand the fluid and diverse organizational structures in the field.

- 9.7 Cultivate consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution.
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## 10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Arts, Media, and Entertainment sector:

- 10.1 Know universal cultural concepts and identify cultural differences.
  - 10.2 Articulate the characteristics of various art forms from past and present cultures and analyze similar themes used by various cultures in a variety of arts settings.
  - 10.3 Understand the historic impact of the arts and technology on society.
  - 10.4 Compare and contrast the roles of creators, performers, and others involved in the production and presentation of the arts.
  - 10.5 Define the factors that could affect creators, performers, and others involved in the production and presentation of the arts.
  - 10.6 Know the appropriate skills and vocabulary of the art form.
  - 10.7 Understand and analyze the elements of the art form.
  - 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).
  - 10.9 Understand the economic basis of for-profit and not-for-profit performing arts organizational structures.
  - 10.10 Use technical applications in the creative process, where appropriate.
  - 10.11 Know the ways in which literature builds an understanding of the many dimensions (e.g., intellectual and philosophical, moral and ethical, aesthetic) of human experience.
  - 10.12 Use a variety of strategies (e.g., personal experience, discussion, research) to comprehend, interpret, evaluate, and appreciate source and technical documents and materials.
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## 11.0 Demonstration and Application

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

## PATHWAY STANDARDS

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### A. Media and Design Arts Pathway

The Media and Design Arts Pathway includes those occupations that use tools and material as the primary means of creative expression. This career pathway requires the development of knowledge and skills by which individuals are able to express themselves through manipulation of physical objects. Careers in Media and Design Arts may be found in the following broad fields:

- **Visual.** Traditional fine artist, photographer, designer in various media, commercial artist, architect
- **Aural.** Manipulator of sound; for example, sound engineer involved in mixing, recording, sampling, and broadcasting
- **Written.** Writer, publisher, printer, scriptwriter, poet
- **Electronic.** Computer graphics artist, computer game developer, Web designer (Many new and traditional art forms depend on electronic technology in the creative process.)

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*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.*

(The standards listed below retain in parentheses the numbering as specified in the VPA and ELA content standards adopted by the State Board of Education.)

A1.1 Specific applications of VPA Artistic Perception standards for Visual Arts at the proficient level (grades nine through twelve):

- (1.1) Identify and use the principles of design to discuss, analyze, and write about visual aspects in the environment and in works of art, including their own.
- (1.3) Research and analyze the work of an artist and write about the artist's distinctive style and its contribution to the meaning of the work.
- (1.4) Analyze and describe how the composition of a work of art is affected by the use of a particular principle of design.
- (1.5) Analyze the material used by a given artist and describe how its use influences the meaning of the work.
- (1.6) Compare and contrast similar styles of works of art done in electronic media with those done with materials traditionally used in the visual arts.

Specific applications of VPA Artistic Perception standards for Visual Arts at the advanced level (grades nine through twelve):

- (1.1) Analyze and discuss complex ideas, such as distortion, color theory, arbitrary color, scale, expressive content, and real versus virtual in works of art.
- (1.3) Analyze their works of art as to personal direction and style.

- (1.5) Compare how distortion is used in photography or video with how the artist uses distortion in painting or sculpture.
- (1.6) Describe the use of the elements of art to express mood in one or more of their works of art.
- (1.7) Select three works of art from their art portfolio and discuss the intent of the work and the use of the media.
- (1.8) Analyze the works of a well-known artist as to the art media selected and the effect of that selection on the artist's style.

A1.2 Specific applications of VPA Creative Expression standards for Visual Arts at the proficient level (grades nine through twelve):

- (2.1) Solve a visual arts problem that involves the effective use of the elements of art and the principles of design.
- (2.2) Prepare a portfolio of original two- and three-dimensional works of art that reflects refined craftsmanship and technical skills.
- (2.3) Develop and refine skill in the manipulation of digital imagery (either still or video).
- (2.4) Review and refine observational drawing skills.

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.
- (2.2) Plan and create works of art that reflect complex ideas, such as distortion, color theory, arbitrary color, scale, expressive content, and real versus virtual.
- (2.4) Demonstrate in their own works of art a personal style and an advanced proficiency in communicating an idea, theme, or emotion.
- (2.5) Use innovative visual metaphors in creating works of art.
- (2.6) Present a universal concept in a multimedia work of art that demonstrates knowledge of technology skills.

A1.3 Specific applications of VPA Historical and Cultural Context standards for Visual Arts at the proficient level (grades nine through twelve):

- (3.1) Identify similarities and differences in the purposes of art created in selected cultures.
- (3.2) Identify and describe the role and influence of new technologies on contemporary works of art.
- (3.3) Identify and describe trends in the visual arts and discuss how the issues of time, place, and cultural influence are reflected in selected works of art.

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.
- (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.

(3.3) Investigate and discuss universal concepts expressed in works of art from diverse cultures.

A1.4 Specific applications of VPA Aesthetic Valuing standards for Visual Arts at the proficient level (grades nine through twelve):

- (4.1) Articulate how personal beliefs, cultural traditions, and current social, economic, and political contexts influence the interpretation of the meaning or message in a work of art.
- (4.3) Formulate and support a position regarding the aesthetic value of a specific work of art and change or defend that position after considering the views of others.
- (4.4) Articulate the process and rationale for refining and reworking one of their own works of art.
- (4.5) Employ the conventions of art criticism in writing and speaking about works of art.

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.
- (4.3) Analyze and articulate how society influences the interpretation and message of a work of art.
- (4.6) Develop written criteria for the selection of a body of work from their portfolios that represents significant achievements.

A1.5 Specific applications of VPA Connections, Relationships, Applications standards for Visual Arts at the proficient level (grades nine through twelve):

- (5.2) Create a work of art that communicates a cross-cultural or universal theme taken from literature or history.
- (5.3) Compare and contrast the ways in which different media (television, newspapers, magazines) cover the same art exhibition.
- (5.4) Demonstrate an understanding of the various skills of an artist, art critic, art historian, art collector, art gallery owner, and philosopher of art (aesthete).

Specific applications of VPA Connections, Relationships, Applications standards for Visual Arts at the advanced level (grades nine through twelve):

- (5.1) Speculate on how advances in technology might change the definition and function of the visual arts.
- (5.2) Compare and contrast works of art, probing beyond the obvious and identifying psychological content found in the symbols and images.
- (5.3) Prepare portfolios of their original works of art for a variety of purposes (e.g., review for postsecondary application, exhibition, job application, and personal collection).
- (5.4) Investigate and report on the essential features of modern or emerging technologies that affect or will affect visual artists and the definition of the visual arts.

- A1.6 Specific applications of ELA Literary Response and Analysis standards (grades eleven and twelve):
- (3.1) Analyze characteristics of subgenres (e.g., satire, parody, allegory, pastoral) that are used in poetry, prose, plays, novels, short stories, essays, and other basic genres.
  - (3.3) Analyze the ways in which irony, tone, mood, the author’s style, and the “sound” of language achieve specific rhetorical or aesthetic purposes or both.
  - (3.6) Analyze the way in which authors through the centuries have used archetypes drawn from myth and tradition in literature, film, political speeches, and religious writings (e.g., how the archetypes of banishment from an ideal world may be used to interpret Shakespeare’s tragedy *Macbeth*).
  - (3.9) Analyze the philosophical arguments presented in literary works to determine whether the authors’ positions have contributed to the quality of each work and the credibility of the characters. (Philosophical approach)
- A1.7 Specific applications of ELA Writing Strategies and Applications standards (grades eleven and twelve):
- (1.1) Demonstrate an understanding of the elements of discourse (e.g., purpose, speaker, audience, form) when completing narrative, expository, persuasive, or descriptive writing assignments.
  - (1.2) Use point of view, characterization, style (e.g., use of irony), and related elements for specific rhetorical and aesthetic purposes.
  - (1.4) Enhance meaning by employing rhetorical devices, including the extended use of parallelism, repetition, and analogy; the incorporation of visual aids (e.g., graphs, tables, pictures); and the issuance of a call for action.
  - (1.5) Use language in natural, fresh, and vivid ways to establish a specific tone.
  - (1.8) Integrate databases, graphics, and spreadsheets into word-processed documents.
  - (1.9) Revise text to highlight the individual voice, improve sentence variety and style, and enhance subtlety of meaning and tone in ways that are consistent with the purpose, audience, and genre.
  - (2.2) Write responses to literature:
    - a. Demonstrate a comprehensive understanding of the significant ideas in works or passages.
    - b. Analyze the use of imagery, language, universal themes, and unique aspects of the text.
    - c. Support important ideas and viewpoints through accurate and detailed references to the text and to other works.
    - d. Demonstrate an understanding of the author’s use of stylistic devices and an appreciation of the effects created.
    - e. Identify and assess the impact of perceived ambiguities, nuances, and complexities within the text.
  - (2.3) Write reflective compositions:
    - a. Explore the significance of personal experiences, events, conditions, or concerns by using rhetorical strategies (e.g., narration, description, exposition, persuasion).



- b. Draw comparisons between specific incidents and broader themes that illustrate the writer’s important beliefs or generalizations about life.
- c. Maintain a balance in describing individual incidents and relate those incidents to more general and abstract ideas.

(2.4) Write historical investigation reports:

- a. Use exposition, narration, description, argumentation, or some combination of rhetorical strategies to support the main proposition.
- b. Analyze several historical records of a single event, examining critical relationships between elements of the research topic.
- c. Explain the perceived reason or reasons for the similarities and differences in historical records with information derived from primary and secondary sources to support or enhance the presentation.
- d. Include information from all relevant perspectives and take into consideration the validity and reliability of sources.
- e. Include a formal bibliography.

Specific applications of ELA Written and Oral English Language Conventions standards (grades eleven and twelve):

- (1.1) Demonstrate control of grammar, diction, and paragraph and sentence structure and an understanding of English usage.
- (1.2) Produce legible work that shows accurate spelling and correct punctuation and capitalization.
- (1.3) Reflect appropriate manuscript requirements in writing.

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*A2.0 Students understand the key technical and technological requirements applicable to various segments of the Media and Design Arts Pathway:*

- 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.
- A2.2 Know the component steps and skills required to design, edit, and produce a production for audio, video, electronic, or printed presentation.
- A2.3 Use technology to create a variety of audio, visual, written, and electronic products and presentations.
- A2.4 Know the features and uses of current and emerging technology related to computing (e.g., optical character recognition, sound processing, cable TV, cellular phones).
- A2.5 Know the writing processes, formats, and conventions used for various media.
- A2.6 Understand technical support related to various media and design arts.
- A2.7 Know how advanced and emerging technologies (e.g., virtual environment or voice recognition software) may affect or improve media and design arts products or productions.
- A2.8 Use models, simulations, and other tests to determine optimal design solutions from a variety of options.

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## B. Performing Arts Pathway

The Performing Arts Pathway focuses on the direct creation of art and entertainment by the individual artist instead of through a secondary physical medium. Performing artists are themselves the medium of creative expression. The Performing Arts Pathway includes the following career options:

- **Aural performance.** Singer, musician, voiceover artist, narrator, composer, music arranger
- **Physical performance.** Dancer, mime, model, acrobat, stunt worker
- **Theatrical performance.** Actor (e.g., stage, film, video, DVD), performance artist, stage illusionist

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*B1.0 Students master appropriate visual and performing arts (VPA) content standards for artistic perception in relation to theatrical, aural, and physical performance.*

(The standards listed below retain in parentheses the numbering as specified in the VPA content standards adopted by the State Board of Education.)

**B1.1** Specific applications of VPA Artistic Perception standards for Dance at the advanced level (grades nine through twelve):

- (1.1) Demonstrate highly developed physical coordination and control when performing complex locomotor and axial movement phrases from a variety of genres (e.g., refined body articulation, agility, balance, strength).
- (1.2) Perform in multiple dance genres, integrating an advanced level of technical skill and clear intent.
- (1.3) Memorize and perform complicated works of dance at a level of professionalism (i.e., a high level of refinement).
- (1.4) Apply a wide range of kinesthetic communication, demonstrating clarity of intent and stylistic nuance.
- (1.5) Select specific dance vocabulary to describe movement and dance elements in great detail.

**B1.2** Specific applications of VPA Artistic Perception standards for Music at the advanced level (grades nine through twelve):

- (1.1) Read a full instrument or vocal score and describe how the elements of music are used.
- (1.2) Transcribe simple songs into melodic and rhythmic notation when presented aurally (level of difficulty: 2 on a scale of 1–6).
- (1.3) Sight-read music accurately and expressively (level of difficulty: 4 on a scale of 1–6).
- (1.4) Analyze and describe significant musical events perceived and remembered in a given aural example.
- (1.5) Analyze and describe the use of musical elements in a given work that makes it unique, interesting, and expressive.
- (1.6) Compare and contrast the use of form, both past and present, in a varied repertoire of music from diverse genres, styles, and cultures.

- B1.3 Specific applications of VPA Artistic Perception standards for Theatre at the advanced level (grades nine through twelve):
- (1.1) Use the vocabulary of theatre, such as *genre, style, acting values, theme, and design*, to describe theatrical experiences.
  - (1.2) Research, analyze, or serve as the dramaturg for a play in collaboration with the director, designer, or playwright.
  - (1.3) Identify the use of metaphor, subtext, and symbolic elements in scripts and theatrical productions.

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B2.0 *Students master appropriate VPA content standards for Creative Expression in relation to theatrical, aural, and physical performance.*

- B2.1 Specific applications of VPA Creative Expression standards for Dance at the proficient level (grades nine through twelve):
- (2.2) Identify and apply basic music elements (e.g., rhythm, meter, tempo, timbre) to construct and perform dances.
  - (2.3) Design a dance that utilizes an established dance style or genre.
  - (2.4) Perform original works that employ personal artistic intent and communicate effectively.
  - (2.5) Perform works by various dance artists communicating the original intent of the work while employing personal artistic intent and interpretation.

Specific applications of VPA Creative Expression standards for Dance at the advanced level (grades nine through twelve):

- (2.1) Create a diverse body of works of dance, each of which demonstrates originality, unity, clarity of intent, and a dynamic range of movement.
  - (2.2) Use dance structures, musical forms, theatrical elements, and technology to create original works.
  - (2.3) Notate dances, using a variety of systems (e.g., labanotation, motif writing, personal systems).
  - (2.4) Perform a diverse range of works by various dance artists, maintaining the integrity of the work while applying personal artistic expression.
  - (2.6) Teach to peers a variety of complex movement patterns and phrases.
- B2.2 Specific applications of VPA Creative Expression for Music at the advanced level (grades nine through twelve):
- (2.1) Sing a repertoire of vocal literature representing various genres, styles, and cultures with expression, technical accuracy, tone quality, vowel shape, and articulation—written and memorized, by oneself and in ensembles (level of difficulty: 5 on a scale of 1–6).
  - (2.2) Sing music written in four parts with and without accompaniment.
  - (2.3) Sing in small ensembles, with one performer for each part (level of difficulty: 5 on a scale of 1–6).
  - (2.4) Perform on an instrument a repertoire of instrumental literature representing various genres, styles, and cultures with expression, technical accuracy, tone quality, and articulation, by oneself and in ensembles (level of difficulty: 5 on a scale of 1–6).

- (2.5) Perform in small instrumental ensembles with one performer for each part (level of difficulty: 5 on a scale of 1–6).
- (2.6) Compose music in distinct styles.
- (2.7) Compose and arrange music for various combinations of voice and acoustic and digital/electronic instruments, using appropriate ranges and traditional and nontraditional sound sources.
- (2.8) Create melodic and rhythmic improvisations in a style or genre within a musical culture (e.g., gamelan, jazz, and mariachi).

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.
- (2.2) Write dialogues and scenes, applying basic dramatic structure: exposition, complication, conflict, crises, climax, and resolution.
- (2.3) Design, produce, or perform scenes or plays from a variety of theatrical periods and styles, including Shakespearean and contemporary realism.

Specific applications of VPA Creative Expression standards for Theatre at the advanced level (grades nine through twelve):

- (2.1) Make acting choices, using script analysis, character research, reflection, and revision to create characters from classical, contemporary, realistic, and nonrealistic dramatic texts.
- (2.2) Improvise or write dialogues and scenes, applying basic dramatic structure (exposition, complication, crises, climax, and resolution) and including complex characters with unique dialogue that motivates the action.
- (2.3) Work collaboratively as designer, producer, or actor to meet directorial goals in scenes and plays from a variety of contemporary and classical playwrights.

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*B3.0 Students master appropriate VPA content standards for Historical and Cultural Context in relation to theatrical, aural, and physical performance.*

B3.1 Specific applications of VPA Historical and Cultural Context standards for Dance at the proficient level (grades nine through twelve):

- (3.2) Describe ways in which folk/traditional, social, and theatrical dances reflect their specific cultural context.

Specific applications of VPA Historical and Cultural Context standards for Dance at the advanced level (grades nine through twelve):

- (3.1) Identify, analyze, and perform folk/traditional, social, and theatrical dances with technical accuracy and appropriate stylistic nuances.
- (3.2) Analyze the role dancers and choreographers play in the interpretation of dances in various historical and cultural settings.
- (3.3) Compare and contrast universal themes and sociopolitical issues in a variety of dances from different cultural contexts and time periods.

B3.2 Specific applications of VPA Historical and Cultural Context standards for Music at the proficient level (grades nine through twelve):

- (3.2) Explain the various roles that musicians perform, identify representative individuals who have functioned in each role, and explain their activities and achievements.
- (3.5) Classify, by genre or style and historical period or culture, unfamiliar but representative aural examples of music and explain the reasoning for the classification.

Specific applications of VPA Historical and Cultural Context standards for Music at the advanced level (grades nine through twelve):

- (3.1) Analyze how the roles of musicians and composers have changed or remained the same throughout history.
- (3.2) Identify uses of music elements in nontraditional art music (e.g., atonal, twelve-tone, serial).
- (3.3) Compare and contrast the social function of a variety of music forms in various cultures and time periods.
- (3.4) Perform music from a variety of cultures and historical periods.
- (3.8) Compare and contrast musical genres or styles that show the influence of two or more cultural traditions.

B3.3 Specific applications of VPA Historical and Cultural Context standards for Theatre at the proficient level (grades nine through twelve):

- (3.1) Identify and compare how film, theatre, television, and electronic media productions influence values and behaviors.
- (3.3) Identify key figures, works, and trends in world theatrical history from various cultures and time periods.

Specific applications of VPA Historical and Cultural Context standards for Theatre at the advanced level (grades nine through twelve):

- (3.1) Research and perform monologues in various historical and cultural contexts, using accurate and consistent physical mannerisms and dialect.
- (3.2) Analyze the impact of traditional and nontraditional theatre, film, television, and electronic media on society.
- (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.

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B4.0 *Students master appropriate VPA content standards for Aesthetic Valuing in relation to theatrical, aural, and physical performance.*

B4.1 Specific applications of VPA Aesthetic Valuing standards for Dance at the advanced level (grades nine through twelve):

- (4.1) Critique dance works to improve choreographic structure and artistic presence.
- (4.2) Use selected criteria to compare, contrast, and assess various dance forms (e.g., concert jazz, street, liturgical).

- (4.3) Analyze evolving personal preferences about dance styles and choreographic forms to identify change and development in personal choices.
- (4.4) Research and assess how specific dance works change because of the impact of historic and cultural influences on their interpretations (e.g., because of the loss of lives in war, Fancy Dancing, once performed only by men, is now also performed by women).
- (4.5) Evaluate how aesthetic principles apply to choreography designed for technological media (e.g., film, video, TV, computer imaging).

B4.2 Specific applications of VPA Aesthetic Valuing standards for Music at the proficient level (grades nine through twelve):

- (4.1) Develop specific criteria for making informed critical evaluations of the quality and effectiveness of performances, compositions, arrangements, and improvisations and apply those criteria in personal participation in music.
- (4.2) Evaluate a performance, composition, arrangement, or improvisation by comparing each with an exemplary model.

Specific applications of VPA Aesthetic Valuing standards for Music at the advanced level (grades nine through twelve):

- (4.1) Compare and contrast how a composer's intentions result in a work of music and how that music is used.
- (4.2) Analyze and explain how and why people in a particular culture use and respond to specific musical works from their own culture.
- (4.3) Compare and contrast the musical means used to create images or evoke feelings and emotions in works of music from various cultures.

B4.3 Specific applications of VPA Aesthetic Valuing standards for Theatre at the proficient level (grades nine through twelve):

- (4.2) Report on how a specific actor used drama to convey meaning in his or her performances.

Specific applications of VPA Aesthetic Valuing standards for Theatre at the advanced level (grades nine through twelve):

- (4.1) Use complex evaluation criteria and terminology to compare and contrast a variety of genres of dramatic literature.
- (4.2) Draw conclusions about the effectiveness of informal and formal productions, films/videos, or electronic media on the basis of intent, structure, and quality of the work.
- (4.3) Develop a thesis based on research as to why people create theatre.

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B5.0 *Students master appropriate VPA content standards for Connections, Relationships, Applications in relation to theatrical, aural, and physical performances.*

B5.1 Specific applications of VPA Connections, Relationships, Applications standards for Dance at the proficient level (grades nine through twelve):

- (5.5) Examine the training, education, and experience needed to pursue dance career options (e.g., performer, choreographer, dance therapist, teacher, historian, critic, filmmaker).

Specific applications of VPA Connections, Relationships, Applications standards for Dance at the advanced level (grades nine through twelve):

- (5.1) Demonstrate effective knowledge and skills in using audiovisual equipment and technology when creating, recording, and producing dance.
- (5.2) Compare the study and practice of dance techniques to motion, time, and physical principles from scientific disciplines (e.g., muscle and bone identification and usage; awareness of matter, space, time, and energy/force).

B5.2 Specific applications of VPA Connections, Relationships, Applications standards for Music at the proficient level (grades nine through twelve):

- (5.2) Analyze the role and function of music in radio, television, and advertising.
- (5.3) Research musical careers in radio, television, and advertising.

Specific applications of VPA Connections, Relationships, Applications standards for Music at the advanced level (grades nine through twelve):

- (5.2) Analyze the process for arranging, underscoring, and composing music for film and video productions.
- (5.3) Identify and explain the various factors involved in pursuing careers in music.

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.

Specific applications of VPA Connections, Relationships, Applications standards for Theatre at the advanced level (grades nine through twelve):

- (5.2) Demonstrate the ability to create rehearsal schedules, set deadlines, organize priorities, and identify needs and resources when participating in the production of a play or scene.
- (5.4) Develop advanced or entry-level competencies for a career in an artistic or technical field in the theatrical arts.

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B6.0 *Students understand essential technical and technological requirements applicable to various segments of the Performing Arts Pathway:*

- B6.1 Understand the technical aspects of theatre (e.g., lights, sound, properties, costumes, makeup) from the perspective of the playwright and actor.
- B6.2 Analyze the physical, emotional, and social dimensions of characters found in dramatic texts from various genres and media.
- B6.3 Know various techniques and methods for theatrical, aural, and physical arts performances.
- B6.4 Understand how stage sets, costumes, lighting, musical instruments, props, and other effects support a performance.
- B6.5 Understand the differing roles of creators, performers, and others involved in the production and presentation of the performing arts.

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## C. Production and Managerial Arts Pathway

Whatever the form or medium of creative expression, all careers in the Arts, Media, and Entertainment sector require “publication” or a public presentation in one way or another. Consequently, the Production and Managerial Arts Pathway focuses on the technical, organizational, and managerial knowledge and skills necessary to bring arts, media, and entertainment to the public. Career options in the Production and Managerial Arts Pathway may be found in the following fields:

- **Theatrical and Exhibition.** Technicians; talent managers for actors; producers for theatre, television, and motion pictures; managers for stage, theatres, and museums; event planners
- **Aural.** Technicians; talent managers for musicians, singers, and voice-over artists; producers for musical programs and events (e.g., concerts, musical theatre, opera)
- **Written.** Technicians; managers and agents for writers; acquisitions editors in publishing; proofreaders; music copyists; publishers
- **Electronic.** Technicians; managers for online publishing, entertainment, and Web sites

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*C1.0 Students understand important elements of technical and technology-related production management:*

- C1.1 Understand technical support functions in the arts industry.
- C1.2 Apply knowledge of equipment and skills related to production in a variety of arts, media, and entertainment occupations.
- C1.3 Apply decision-making and problem-solving techniques to repair and replacement procedures for media and arts equipment and facilities.
- C1.4 Know the elements involved in creating a media or performing arts production for video or electronic presentation.

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*C2.0 Students demonstrate important skills and an understanding of the complexities of production planning:*

- C2.1 Know the main elements and functional responsibilities involved in the production and presentation of the performing, visual, and media arts.
- C2.2 Know how artistic processes, organizational structure, and business principles are interrelated in the various arts.
- C2.3 Identify the activities and linkages from each stage associated with the preproduction, production, and postproduction of a creative project.
- 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.
- 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.



- C2.6 Apply knowledge of services, equipment capabilities, the workflow process, data acquisition, and technology to a timely completion of projects.
  - C2.7 Understand the audition and review process for artists, actors, musicians, singers, conductors, composers, writers, narrators, and technicians.
  - C2.8 Critique the general coordination of various elements in a project or production.
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C3.0 *Students understand the key elements of promoting a production:*

- C3.1 Know the business aspects of the arts, media, and entertainment industry.
- C3.2 Understand basic marketing principles and the use of promotional materials, such as standard public service announcements, commercials/advertisements, press kits, and advertising tags.
- 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.



# **Building Trades and Construction Industry Sector**

## *Career Pathways*

- ◆ Cabinetmaking and Wood Products
- ◆ Engineering and Heavy Construction
- ◆ Mechanical Construction
- ◆ Residential and Commercial Construction



# Building Trades and Construction Industry Sector

The Building Trades and Construction sector provides a foundation in the building trades and construction industry for secondary students in California. Students engage in an instructional program that integrates academic and technical preparation and focuses on career awareness, career exploration, and skill preparation in the building trades and construction industry. The sector encompasses four career pathways: Cabinetmaking and Wood Products, Engineering and Heavy Construction, Mechanical Construction, and Residential and Commercial Construction. These pathways emphasize processes, systems, and the way in which structures are built. The knowledge and skills are acquired in a sequential, standards-based pathway program that integrates hands-on, project-based, and work-based instruction as well as internship, community classroom, work experience, apprenticeship, and cooperative career technical education. Standards included in the Building Trades and Construction sector are designed to prepare students for technical training, postsecondary education, and entry to a career.

## FOUNDATION STANDARDS

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### 1.0 Academics

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

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, history–social science, and visual and performing arts content standards adopted by the State Board of Education.)*

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#### 1.1 Mathematics

Specific applications of Number Sense standards (grade seven):

- (1.1) Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.

- (1.2) Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
- (1.3) Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
- (1.4) Differentiate between rational and irrational numbers.
- (1.5) Know that every rational number is either a terminating or a repeating decimal and be able to convert terminating decimals into reduced fractions.
- (1.6) Calculate the percentage of increases and decreases of a quantity.
- (1.7) Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

Specific applications of Mathematical Reasoning standards (grade seven):

- (2.1) Use estimation to verify the reasonableness of calculated results.
- (2.2) Apply strategies and results from simpler problems to more complex problems.
- (2.3) Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- (2.4) Make and test conjectures by using both inductive and deductive reasoning.
- (2.5) Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- (2.6) Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- (2.7) Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- (2.8) Make precise calculations and check the validity of the results from the context of the problem.
- (3.1) Evaluate the reasonableness of the solution in the context of the original situation.
- (3.2) Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- (3.3) Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.

Specific applications of Algebra I standards (grades eight through twelve):

- (4.0) Students simplify expressions before solving linear equations and inequalities in one variable, such as  $3(2x-5) + 4(x-2) = 12$ .
- (5.0) Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
- (15.0) Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.

Specific applications of Geometry standards (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.
- (11.0) Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.
- (12.0) Students find and use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems.
- (15.0) Students use the Pythagorean theorem to determine distance and find missing lengths of sides of right triangles.
- (16.0) Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line.
- (19.0) Students use trigonometric functions to solve for an unknown length of a side of a right triangle, given an angle and a length of a side.

### 1.2 Science

Specific applications of Physics standards (grades nine through twelve):

- (3.a) Students know heat flow and work are two forms of energy transfer between systems.
- (3.g) Students know how to solve problems involving heat flow, work, and efficiency in a heat engine and know that all real engines lose some heat to their surroundings.
- (5.b) Students know how to solve problems involving Ohm's law.

Specific applications of Investigation and Experimentation standards (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.
- (1.d) Formulate explanations by using logic and evidence.

### 1.3 History–Social Science

Specific applications of World History, Culture, and Geography: The Modern World standards (grade ten):

- (10.3) Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.
- (10.3.5) Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (11.5) Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.

- (11.5.7) Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.

Specific applications of Principles of Economics standards (grade twelve):

- (12.1) Students understand common economic terms and concepts and economic reasoning.
- (12.1.1) Examine the causal relationship between scarcity and the need for choices.
- (12.1.2) Explain opportunity cost and marginal benefit and marginal cost.
- (12.1.3) Identify the difference between monetary and nonmonetary incentives and how changes in incentives cause changes in behavior.
- (12.1.4) Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.
- (12.1.5) Analyze the role of a market economy in establishing and preserving political and personal liberty (e.g., through the works of Adam Smith).
- (12.2) Students analyze the elements of America's market economy in a global setting.
- (12.2.1) Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.
- (12.2.2) Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.
- (12.2.3) Explain the roles of property rights, competition, and profit in a market economy.
- (12.2.4) Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.
- (12.2.5) Understand the process by which competition among buyers and sellers determines a market price.
- (12.2.6) Describe the effect of price controls on buyers and sellers.
- (12.2.7) Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.
- (12.2.8) Explain the role of profit as the incentive to entrepreneurs in a market economy.
- (12.2.9) Describe the functions of the financial markets.
- (12.2.10) Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.
- (12.3) Students analyze the influence of the federal government on the American economy.
- (12.3.1) Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.

- (12.3.2) Identify the factors that may cause the costs of government actions to outweigh the benefits.
- (12.3.3) Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.
- (12.3.4) Understand the aims and tools of monetary policy and their influence on economic activity (e.g., the Federal Reserve).
- (12.4) Students analyze the elements of the U.S. labor market in a global setting.
  - (12.4.1) 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.
  - (12.4.2) Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.
  - (12.4.3) Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.
  - (12.4.4) Explain the effects of international mobility of capital and labor on the U.S. economy.
- (12.6) Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States's borders.
  - (12.6.1) Identify the gains in consumption and production efficiency from trade, with emphasis on the main products and changing geographic patterns of twentieth-century trade among countries in the Western Hemisphere.
  - (12.6.2) Compare the reasons for and the effects of trade restrictions during the Great Depression compared with present-day arguments among labor, business, and political leaders over the effects of free trade on the economic and social interests of various groups of Americans.
  - (12.6.3) Understand the changing role of international political borders and territorial sovereignty in a global economy.
  - (12.6.4) Explain foreign exchange, the manner in which exchange rates are determined, and the effects of the dollar's gaining (or losing) value relative to other currencies.

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#### 1.4 *Visual and Performing Arts*

Specific applications of Visual Arts standards at the proficient level (grades nine through twelve):

- (1.4) Analyze and describe how the composition of a work of art is affected by the use of a particular principle of design.
- (1.5) Analyze the material used by a given artist and describe how its use influences the meaning of the work.
- (2.1) Solve a visual arts problem that involves the effective use of the elements of art and the principles of design.

- (2.6) Create a two- or three-dimensional work of art that addresses a social issue.

Specific applications of Visual Arts standards 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.
- (2.2) Plan and create works of art that reflect complex ideas, such as distortion, color theory, arbitrary color, scale, expressive content, and real versus virtual.
- (4.6) Develop written criteria for the selection of a body of work from their portfolios that represents significant achievements.

## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English-language arts content standards adopted by the State Board of Education.)*

### 2.1 Reading

Specific applications of Reading Comprehension standards (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.
- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (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).

Specific applications of Reading Comprehension standards (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.

### 2.2 Writing

Specific applications of Writing Strategies standards (grade eight):

- (1.4) Plan and conduct multiple-step information searches by using computer networks and modems.
- (1.5) Achieve an effective balance between researched information and original ideas.
- (1.6) Revise writing for word choice; appropriate organization; consistent point of view; and transitions between paragraphs, passages, and ideas.

Specific applications of Writing Strategies standards (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.



- (1.4) Develop the main ideas within the body of the composition through supporting evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions).

Specific applications of Writing Strategies and Applications standards (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).
- (1.7) Use systematic strategies to organize and record information (e.g., anecdotal scripting, annotated bibliographies).
- (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.

### 2.3 *Written and Oral English Language Conventions*

Specific applications of English Language Conventions standards (grades nine and ten):

- (1.4) Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.

### 2.4 *Listening and Speaking*

Specific applications of Listening and Speaking Strategies and Applications standards (grade eight):

- (1.1) Analyze oral interpretations of literature, including language choice and delivery, and the effect of the interpretations on the listener.
- (1.2) Paraphrase a speaker's purpose and point of view and ask relevant questions concerning the speaker's content, delivery, and purpose.
- (1.3) Organize information to achieve particular purposes by matching the message, vocabulary, voice modulation, expression, and tone to the audience and purpose.
- (1.4) Prepare a speech outline based upon a chosen pattern of organization, which generally includes an introduction; transitions, previews, and summaries; a logically developed body; and an effective conclusion.
- (1.5) Use precise language, action verbs, sensory details, appropriate and colorful modifiers, and the active rather than the passive voice in ways that enliven oral presentations.
- (1.6) Use appropriate grammar, word choice, enunciation, and pace during formal presentations.

- (1.7) Use audience feedback (e.g., verbal and nonverbal cues):
  - a. Reconsider and modify the organizational structure or plan.
  - b. Rearrange words and sentences to clarify the meaning.
- (1.8) Evaluate the credibility of a speaker (e.g., hidden agendas, slanted or biased material).
- (1.9) Interpret and evaluate the various ways in which visual image makers (e.g., graphic artists, illustrators, news photographers) communicate information and affect impressions and opinions.
- (2.1) Deliver narrative presentations (e.g., biographical, autobiographical):
  - a. Relate a clear, coherent incident, event, or situation by using well-chosen details.
  - b. Reveal the significance of, and the subject's attitude about, the incident, event, or situation.
  - c. Employ narrative and descriptive strategies (e.g., relevant dialogue, specific action, physical description, background description, comparison or contrast of characters).
- (2.2) Deliver oral responses to literature:
  - a. Interpret a reading and provide insight.
  - b. Connect the students' own responses to the writer's techniques and to specific textual references.
  - c. Draw supported inferences about the effects of a literary work on its audience.
  - d. Support judgments through references to the text, other works, other authors, or personal knowledge.
- (2.3) Deliver research presentations:
  - a. Define a thesis.
  - b. Record important ideas, concepts, and direct quotations from significant information sources and paraphrase and summarize all relevant perspectives on the topic, as appropriate.
  - c. Use a variety of primary and secondary sources and distinguish the nature and value of each.
  - d. Organize and record information on charts, maps, and graphs.
- (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.

- (2.5) Recite poems (of four to six stanzas), sections of speeches, or dramatic soliloquies, using voice modulation, tone, and gestures expressively to enhance the meaning.

Specific applications of Listening and Speaking Strategies and Applications standards (grades nine and ten):

- (1.7) Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.
- (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.
- (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.

Specific applications of Speaking Applications standards (grades eleven and twelve):

- (2.2) Deliver oral reports on historical investigations:
- a. Use exposition, narration, description, persuasion, or some combination of those to support the thesis.
  - b. Analyze several historical records of a single event, examining critical relationships between elements of the research topic.
  - c. Explain the perceived reason or reasons for the similarities and differences by using information derived from primary and secondary sources to support or enhance the presentation.
  - d. Include information on all relevant perspectives and consider the validity and reliability of sources.

- (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.

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### 2.5 *Multimedia*

Understand the importance of technical and computer-aided design and drawing technologies essential to the construction industry, including reading, interpreting, and creating drawings, sketches, and schematics by using the drawing conventions and standards of the construction industry; interpreting and understanding detailed information provided from technical documents (print and electronic) and experienced people; and using computers and calculators in a variety of applications.

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## 3.0 Career Planning and Management

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

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, 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.
- 3.7 Understand the nature of entrepreneurial activities.

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## 4.0 Technology

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

- 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.
- 4.4 Understand ways in which raw materials are collected and processed to produce industrial materials.

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## 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:

- 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.
- 5.4 Apply trouble-shooting strategies, including failure-analysis procedures, in three-dimensional product material and design work.
- 5.5 Apply the design process in the design, development, evaluation, and refinement of a prototype for a construction industry product.

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## 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:

- 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.
- 6.3 Know procedures for and regulations concerning the handling, storage, and disposal of hazardous materials.
- 6.4 Know how regulatory agency laws and regulations are created and enforced.
- 6.5 Evaluate past, present, and future impacts of technological developments on the environment.
- 6.6 Understand the importance of identifying health and safety problems as well as asking for help or approaching supervisors to discuss concerns.

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## 7.0 Responsibility and Flexibility

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

- 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.
- 7.5 Understand employer and employee responsibilities in the workplace.

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## 8.0 Ethics and Legal Responsibilities

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

- 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.
- 8.4 Understand how social, organizational, and technological systems work.

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## 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:

- 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, such as SkillsUSA, 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.
- 9.6 Communicate ideas to justify positions, persuade and convince others, confirm responsibility, and evaluate existing policies and procedures.

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## 10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Building Trades and Construction sector:

- 10.1 Understand construction processes and systems and their importance in construction technology.
- 10.2 Maintain and troubleshoot equipment used in the construction industry.

- 10.3 Use, store, and allocate materials efficiently, and use space efficiently.
- 10.4 Understand the planning and design, construction, and servicing of structures and electromechanical systems in relation to construction activities.
- 10.5 Understand the resources used to transport people and goods in the construction industry.
- 10.6 Understand universal graphic conventions and symbols and technical manuals and specifications.
- 10.7 Understand the attributes of good design.
- 10.8 Understand the role of the construction industries sector in the California economy.
- 10.9 Understand the need to participate in sector-related professional improvement activities, SkillsUSA, other career technical education leadership and skill associations, and related career pathway specializations.
- 10.10 Understand the need to obtain and maintain industry-standard, technical certifications significant to an industry sector.
- 10.11 Understand the role of labor unions, both historically and currently, and the impact of unions on worker rights and protections, including wages, working conditions, health and safety, and benefits.

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## 11.0 Demonstration and Application

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

## PATHWAY STANDARDS

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### A. Cabinetmaking and Wood Products Pathway

The Cabinetmaking and Wood Products Pathway provides learning opportunities for students interested in preparing for careers in cabinet construction, millwork, and wood products and covers the construction of both custom and production products.

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*A1.0 Students understand measurement systems in the planning and layout process used in the cabinetmaking and wood products industry:*

- A1.1 Know design solutions to common problems in cabinetmaking and wood products.
  - A1.2 Understand calculation procedures for materials and production requirements for wood product designs.
  - A1.3 Convert scaled drawing measurements to full dimensional layout and template applications.
  - A1.4 Know conventional measurement processes for cabinetmaking and wood products, linear measurements, and conversions of fractions and decimals.
- 

*A2.0 Students understand the safe and appropriate use of hand tools common to the cabinetmaking and wood products industry:*

- 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.
  - A2.2 Maintain and care for common hand tools.
- 

*A3.0 Students understand the safe and appropriate use of portable power tools common to the cabinetmaking and wood products industry:*

- A3.1 Use portable power tools, such as single and compound miter saws, drills, sanders, saber saws, and routers, safely and appropriately.
  - A3.2 Use pneumatic tools, such as pneumatic clamps, grips, framing nail guns, and finishing and brad nail guns, safely and properly.
  - A3.3 Maintain and care for portable power and pneumatic tools.
- 

*A4.0 Students understand the safe and appropriate use of stationary power machines and equipment common to the cabinetmaking and wood products industry:*

- 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.
- A4.2 Understand the proper and safe use of stationary power tools used in the assembly process, such as pneumatic table clamps, case clamps, case frame fasteners, and hardware fasteners.



- A4.3 Understand the proper and safe use of stationary power tools used in the finishing process, such as glue applicators, laminate applicators, and lacquer and paint applicators.
- A4.4 Know the basic care, maintenance, and lock-out procedures for stationary power tools.

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*A5.0 Students understand procedures and processes as they occur in the cabinetmaking and wood products industry:*

- A5.1 Know how to read, understand, design, and construct cabinets accurately from cabinetmaking fabrication and installation plans and specifications.
- A5.2 Understand how to estimate a bill of materials from drawings and specifications for constructing cabinets.
- A5.3 Understand how to create a job schedule in a cabinetmaking project.
- A5.4 Solve common cabinetmaking problems by using construction codes and cabinet building standards stated in the *Manual of Millwork*.
- A5.5 Understand recordkeeping procedures in all phases of cabinetmaking (e.g., time accounting, cost of goods).

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*A6.0 Students understand the value and necessity of practicing occupational safety in the cabinetmaking industry or shop:*

- A6.1 Know the safety rules in the cabinetmaking work environment.
- A6.2 Use hand tools (wood chisels, drills, coping saws) and power tools (routers, sanders, planers) safely in the cabinet working environment.
- A6.3 Understand how to handle and dispose of toxic materials safely and use protective clothing as needed when using lacquers, acetone, thinners, staining materials, and so forth in an environmentally responsible manner.

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*A7.0 Students understand the variety of production processes used in the cabinetmaking and wood products industry:*

- A7.1 Design and create cabinet and wood products.
- A7.2 Develop a production plan, including the layout, bill of materials, and cost analysis, for the production of cabinets or wood products.
- A7.3 Use stationary and portable power tools in milling the components for cabinets and wood products.
- A7.4 Use stationary and portable power tools in the assembly of cabinet and wood product components.
- A7.5 Use finish tools (e.g., airless sprayers, palm sanders) and techniques for finishing cabinets and wood products.
- A7.6 Use installation tools and understand the processes for the installation of cabinets, millwork, and wood products.

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A8.0 *Students understand the impact of financial, technical, and environmental trends on the past and future of the cabinetmaking and wood products industry:*

- A8.1 Understand significant historical trends in cabinetmaking and wood products technology.
- A8.2 Understand environmental regulations that influence the cabinetmaking and wood products industry.
- A8.3 Understand issues of the sustainable use of wood product resources.

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A9.0 *Students understand career preparation and how it applies across all standards for students planning to enter and advance successfully in the cabinetmaking and wood products industry:*

- A9.1 Understand the careers that are available in cabinetmaking and wood products manufacturing and related occupations (e.g., custom crafts, furniture making, marketing).
- A9.2 Understand the need for professional growth across all aspects of the industry, including financial, leadership, and advancement elements.

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## B. Engineering and Heavy Construction Pathway

The Engineering and Heavy Construction Pathway provides learning opportunities for students interested in preparing for careers in engineering and heavy industrial construction (roads, highways, subdivisions). The pathway includes instruction in the way in which these structures are built.

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*B1.0 Students understand and apply measurement systems in the planning and layout process used in the engineering and heavy construction industry:*

- B1.1 Identify design solutions to engineering and heavy construction problems.
  - B1.2 Calculate the required materials, such as soils, aggregate, asphalt, concrete, and pipe, for engineering and heavy construction applications.
  - B1.3 Understand the conversion of scaled blueprint measurements to full-size, on-site parameters.
  - B1.4 Apply conventional engineering and heavy construction measurement processes accurately (e.g., laser transits, laser levels, GPS instruments) for surveying and plan development.
  - B1.5 Know the use of conventional engineering and heavy construction mathematical functions to calculate on-site preparation and site development and improvement materials.
- 

*B2.0 Students understand the safe and appropriate use of hand tools common to the engineering and heavy construction industry:*

- B2.1 Use the common hand tools of the trade, such as rebar cutters, metal stud cutters/pliers, concrete floats/fresnoes, sheet metal cutters/pliers, saws, hammers, chisels, and wrenches, safely and appropriately.
  - B2.2 Maintain and care for common hand tools.
- 

*B3.0 Students understand the safe and appropriate use of portable power tools that are common to the engineering and heavy construction industry and are appropriate to the individual student's level:*

- B3.1 Use portable power tools, such as circular saws, saber saws, reciprocating saws, and straight and right-angle drills, safely and appropriately.
- B3.2 Use pneumatic tools, such as jack hammers, rotary hammers, impact wrenches, concrete tampers, framing nail guns, roofing nail guns, and drills, safely and appropriately.
- B3.3 Maintain and care for portable power tools and pneumatic tools.
- B3.4 Understand the use of heavy equipment in engineering and heavy construction.

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*B4.0 Students understand project management procedures and processes as they occur in an engineering and heavy construction project:*

- B4.1 Know how to read, understand, and construct projects accurately from commercial specifications and blueprints, ensuring compliance with state and local building codes.
- B4.2 Understand how to estimate the cost of supplies and materials for an engineering and heavy construction project.
- B4.3 Understand how to plan all construction phases, including subcontractor schedules, clearing, rough grading, wet and dry utilities, fine grading, concrete, and job closeout.
- B4.4 Solve common construction problems (e.g., grading, drainage) by using commercial construction codes and building standards.
- B4.5 Understand contract administration (e.g., invoicing vendors, subcontractors), including the “draw and voucher” accounting/record system used in construction project management.
- B4.6 Understand the roles in heavy construction of design engineers, estimators, superintendents, project managers, foremen, operators/drivers, administrators, and inspectors.

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*B5.0 Students understand the value and necessity of practicing occupational safety in the engineering and heavy construction laboratory or shop:*

- B5.1 Understand the importance of scaffold and ladder safety.
- B5.2 Know the rules and responsibilities of the various governmental safety agencies and their impact on engineering and heavy construction.
- B5.3 Understand the importance of worksite safety as it pertains to hazardous waste disposal and procedures for containment of toxic and hazardous materials.
- B5.4 Understand the importance of safety and safe work practices (e.g., fire safety, protective clothing) in the welding phases of engineering and heavy construction and the safe operation of heavy equipment (e.g., earth movers, bladders, bulldozers).

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*B6.0 Students understand the variety of building phases, systems, and techniques used in engineering and heavy construction:*

- B6.1 Understand the development of building plans and schedules using processes common to engineering and heavy construction.
- B6.2 Know the appropriate use of tools, processes, and materials in architectural design, project development, and engineering and heavy construction (e.g., structural, electrical, mechanical, and finish phases).

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*B7.0 Students understand the impact of financial, technical, and environmental trends on the past and future of the construction industry:*

B7.1 Understand significant historical trends in engineering and heavy construction technology.

B7.2 Understand environmental regulations that influence engineering and heavy construction projects.

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*B8.0 Students understand career preparation and how it applies across all standards for students planning to enter and advance successfully in the engineering and heavy construction industry:*

B8.1 Understand the careers that are available in the heavy construction industry, including careers in concrete masonry, ironworks, sheet metal sales and installation, plumbing, and construction technology.

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## C. Mechanical Construction Pathway

The Mechanical Construction Pathway provides learning opportunities for students interested in preparing for careers in mechanical construction (plumbing; electrical; heating, ventilation, air conditioning [HVAC]). The pathway includes instruction in the manner in which these systems work in structures.

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*C1.0 Students understand and apply measurement systems in the planning and layout process used in the mechanical construction industry:*

- C1.1 Identify design solutions to given mechanical construction problems.
  - C1.2 Calculate the required equipment and materials for mechanical construction applications.
  - C1.3 Convert scaled blueprint drawing measurements to the full dimensions for a given mechanical construction project.
  - C1.4 Apply conventional construction measurement processes accurately (geometric and trigonometric functions).
  - C1.5 Know the use of conventional construction formulas to determine production requirements, such as converting linear measures to volumetric measures and calculating voltage drop/power requirements (electrical), by using specifications in the National Electrical Code.
- 

*C2.0 Students understand the safe and appropriate use of hand tools common to the mechanical construction industry:*

- C2.1 Use the common hand tools of the trade, such as ladders and safety gear (fall protection), pliers, wire strippers, meters, pipe wrenches, torches, and sheet metal shears and benders, safely and appropriately.
  - C2.2 Maintain and care for the common hand tools used in mechanical construction.
- 

*C3.0 Students understand the safe and appropriate use of portable power tools that are common to mechanical construction and are appropriate for the individual student's level:*

- C3.1 Use portable power tools, such as reciprocating saws, saber saws, chain saws, drills, threaders, and benders, safely and appropriately.
  - C3.2 Use portable pneumatic tools, such as rough framing nail guns, interior finishing and brad nail guns, hammers, impact wrenches, drills, and compressors, safely and appropriately.
  - C3.3 Maintain and care for portable power tools and portable pneumatic tools.
- 

*C4.0 Students understand project management procedures and processes as they occur in a mechanical construction project:*

- C4.1 Know how to read, understand, and construct projects accurately from mechanical construction blueprints and specifications.
- C4.2 Understand how to estimate equipment and materials from blueprints and specifications.

- C4.3 Understand the sequencing of events for a specific mechanical construction project.
- C4.4 Solve common mechanical construction problems by using Uniform Building Codes and *Air Conditioning and Refrigeration Institute Standards*.
- C4.5 Understand industry conventions for the creation and maintenance of construction logs.
- C4.6 Know the importance of customer service/relations as applied to project management and wholesale and retail sales.

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C5.0 *Students understand and practice occupational safety in the mechanical construction industry facility and job site:*

- C5.1 Understand the safe use of electrical materials and electrical connection procedures.
- C5.2 Use appropriate safety procedures and practices in various work environment settings pertaining to mechanical construction (e.g., plumbing, electrical, HVAC).

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C6.0 *Students understand the variety of building phases, systems, and techniques used in mechanical construction:*

- C6.1 Develop building plans and schedules by using processes common to mechanical construction.
- C6.2 Understand processes and materials appropriate to architectural design and mechanical construction (e.g., structural, electrical, mechanical, and finish phases).
- C6.3 Understand the phases of mechanical construction, such as rough and finish, electrical, sheet metal ducting, and HVAC installation.

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C7.0 *Students understand the impact of financial, technical, and environmental trends on the past and future of the mechanical construction industry:*

- C7.1 Understand significant historical trends in the construction industry.
- C7.2 Develop financial plans for construction projects.
- C7.3 Understand environmental regulations that influence mechanical design.
- C7.4 Understand and recognize indoor air quality issues and regulations.

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## D. Residential and Commercial Construction Pathway

The Residential and Commercial Construction Pathway provides learning opportunities for students interested in preparing for careers in construction (framing, plumbing, electrical, and so forth). The standards focus on the manner in which residential and commercial structures are built.

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*D1.0 Students understand and apply measurement systems in the planning and layout process used in the residential construction industry:*

- D1.1 Identify design solutions for residential construction problems.
- D1.2 Calculate required materials for residential construction applications.
- D1.3 Convert scaled blueprint drawing measurements to full dimensions for a given construction project.
- D1.4 Apply conventional construction measurement processes accurately (geometric and trigonometric functions).
- D1.5 Know the use of conventional construction formulas to determine production requirements.

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*D2.0 Students understand the safe and appropriate use of hand tools common to the residential and commercial construction industry:*

- D2.1 Use the common hand tools of the trade, such as hammers, torches, pliers, wire cutters, pipe cutters, saws, chisels (wood and concrete), and wrenches, safely and properly.
- D2.2 Maintain and care for hand tools used in residential and commercial construction.

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*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:*

- D3.1 Use portable power tools, such as circular saws, table saws, saber saws, drills, planers, and sanders, safely and properly.
- D3.2 Use portable pneumatic tools, such as rough framing nail guns, interior finishing and brad nail guns, hammers, impact wrenches, drills, and compressors, safely and appropriately.
- D3.3 Maintain and care for portable power tools and portable pneumatic tools.

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*D4.0 Students understand project management procedures and processes as they occur in a construction project:*

- D4.1 Interpret and use residential construction blueprints and specifications.
- D4.2 Understand how to estimate materials from blueprints and specifications.
- D4.3 Understand the sequencing of events for specific construction projects.



- D4.4 Solve common residential construction problems, such as framing, plumbing, and electrical, by using the official codes adopted by the state and local building standards commission.
- D4.5 Understand industry conventions for the creation and maintenance of construction logs.
- D4.6 Understand customer service/relations as applied to project management and wholesale and retail sales.

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*D5.0 Students understand the value and necessity of practicing occupational safety in the construction industry facility and job site:*

- D5.1 Understand the safe use of electrical connection methods and electrical wiring procedures.
- D5.2 Know the safety procedures and practices in various work environment settings pertaining to residential and commercial construction.

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*D6.0 Students understand the variety of building phases, systems, and techniques used in residential and commercial construction:*

- D6.1 Develop building plans and schedules by using processes common to residential and commercial construction.
- D6.2 Understand the processes and materials (e.g., structural, electrical, mechanical, finish) appropriate to the architectural design and residential construction.
- D6.3 Prepare the site layout and the site, including the grading and engineering of the building pad.
- D6.4 Understand the phases of residential and commercial construction.

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*D7.0 Students understand the impact of financial, technical, environmental, and labor trends on the past and future of the construction industry:*

- D7.1 Understand significant historical trends in the construction industry.
- D7.2 Develop financial plans for construction projects.
- D7.3 Understand the environmental regulations that influence residential and commercial design.

The background of the page features a large, light gray watermark of the Seal of the Alaska Board of Education. The seal is circular and contains the text "BOARD OF EDUCATION" at the top and "ALASKA" at the bottom. The central figure is a Native Alaskan woman in traditional dress, holding a spear. Below her is a bear, and to the left is a scene with a boat and a person. The seal is surrounded by a rope-like border and stars.

## **Education, Child Development, and Family Services Industry Sector**

### *Career Pathways*

- ◆ Child Development
- ◆ Consumer Services
- ◆ Education
- ◆ Family and Human Services



# Education, Child Development, and Family Services Industry Sector

The Education, Child Development, and Family Services sector is composed of four career pathways: Child Development, Consumer Services, Education, and Family and Human Services. The high staffing needs and growing emphasis on improving education will create exciting career opportunities in those fields. The Child Development Pathway provides students with the skills and knowledge they need to pursue careers in child care and related fields, and the Education Pathway emphasizes the preparation of students to become teachers. The Consumer Services Pathway gives students the employment and management skills needed in careers helping consumers. Students pursuing careers in the Family and Human Services Pathway learn the skills they need for careers related to family and social services. The standards are designed to integrate academic and career technical concepts. The components of the pathways support classroom and laboratory instruction or provide supervised, work-based learning experiences and leadership development.

## FOUNDATION STANDARDS

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### 1.0 Academics

Students understand the academic content required for entry into postsecondary education and employment in the Education, Child Development, and Family Services sector. *(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, and history–social science content standards adopted by the State Board of Education.)*

#### 1.1 Mathematics

Specific applications of Number Sense standards (grade seven):

- (1.1) Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.
- (1.2) Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

- (1.3) Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
- (1.4) Differentiate between rational and irrational numbers.
- (1.5) Know that every rational number is either a terminating or a repeating decimal and be able to convert terminating decimals into reduced fractions.
- (1.6) Calculate the percentage of increases and decreases of a quantity.
- (1.7) Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

Specific applications of Mathematical Reasoning standards (grade seven):

- (1.1) Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
- (2.1) Use estimation to verify the reasonableness of calculated results.
- (2.2) Apply strategies and results from simpler problems to more complex problems.
- (2.3) Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- (2.4) Make and test conjectures by using both inductive and deductive reasoning.
- (2.5) Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- (2.6) Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- (2.7) Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- (2.8) Make precise calculations and check the validity of the results from the context of the problem.
- (3.1) Evaluate the reasonableness of the solution in the context of the original situation.
- (3.2) Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- (3.3) Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.

Specific applications of Algebra I standards (grades eight through twelve):

- (1.1) Students use properties of numbers to demonstrate whether assertions are true or false.
- (13.0) Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.
- (24.1) Students explain the difference between inductive and deductive reasoning and identify and provide examples of each.
- (24.2) Students identify the hypothesis and conclusion in logical deduction.
- (24.3) Students use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.

Specific applications of Geometry standards (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.

### 1.2 Science

Specific applications of Investigation and Experimentation standards (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.
- (1.d) Formulate explanations by using logic and evidence.
- (1.m) Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.

### 1.3 History–Social Science

Specific applications of Chronological and Spatial Thinking standards (grades nine through twelve):

- (1) Students compare the present with the past, evaluating the consequences of past events and decisions and determining the lessons that were learned.
- (2) Students analyze how change happens at different rates at different times; understand that some aspects can change while others remain the same; and understand that change is complicated and affects not only technology and politics but also values and beliefs.

Specific applications of Historical Interpretation standards (grades nine through twelve):

- (1) Students show the connections, causal and otherwise, between particular historical events and larger social, economic, and political trends and developments.

Specific applications of World History, Culture, and Geography: The Modern World standards (grade ten):

- (10.3.5) Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.
- (10.10.2) Describe the recent history of the regions, including political divisions and systems, key leaders, religious issues, natural features, resources, and population patterns.
- (10.11) Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (11.5.7) Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.

- (11.8.7) Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural technology.
- (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.

Specific applications of Principles of Economics standards (grade twelve):

- (12.1) Students understand common economic terms and concepts and economic reasoning.
  - (12.1.1) Examine the causal relationship between scarcity and the need for choices.
  - (12.1.2) Explain opportunity cost and marginal benefit and marginal cost.
  - (12.1.3) Identify the difference between monetary and nonmonetary incentives and how changes in incentives cause changes in behavior.
  - (12.1.4) Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.
- (12.2) Students analyze the elements of America's market economy in a global setting.
  - (12.2.1) Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.
  - (12.2.2) Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.
  - (12.2.3) Explain the roles of property rights, competition, and profit in a market economy.
  - (12.2.4) Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.
  - (12.2.5) Understand the process by which competition among buyers and sellers determines a market price.
  - (12.2.6) Describe the effect of price controls on buyers and sellers.
  - (12.2.7) Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.
  - (12.2.8) Explain the role of profit as the incentive to entrepreneurs in a market economy.
  - (12.2.9) Describe the functions of the financial markets.
- (12.3) Students analyze the influence of the federal government on the American economy.
  - (12.3.1) Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.
  - (12.3.2) Identify the factors that may cause the costs of government actions to outweigh the benefits.

- (12.3.3) Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.
- (12.3.4) Understand the aims and tools of monetary policy and their influence on economic activity (e.g., the Federal Reserve).
- (12.4) Students analyze the elements of the U.S. labor market in a global setting.
  - (12.4.1) 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.
  - (12.4.2) Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.
  - (12.4.3) Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.
  - (12.4.4) Explain the effects of international mobility of capital and labor on the U.S. economy.
- (12.6) Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States's borders.
  - (12.6.1) Identify the gains in consumption and production efficiency from trade, with emphasis on the main products and changing geographic patterns of twentieth-century trade among countries in the Western Hemisphere.
  - (12.6.2) Compare the reasons for and the effects of trade restrictions during the Great Depression compared with present-day arguments among labor, business, and political leaders over the effects of free trade on the economic and social interests of various groups of Americans.
  - (12.6.3) Understand the changing role of international political borders and territorial sovereignty in a global economy.
  - (12.6.4) Explain foreign exchange, the manner in which exchange rates are determined, and the effects of the dollar's gaining (or losing) value relative to other currencies.

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## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English-language arts content standards adopted by the State Board of Education.)*

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### 2.1 Reading

Specific applications of Reading Comprehension standards (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.

- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (2.3) Generate relevant questions about readings on issues that can be researched.
- (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).
- (2.7) Critique the logic of functional documents by examining the sequence of information and procedures in anticipation of possible reader misunderstandings.

Specific applications of Reading Comprehension standards (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.

## 2.2 Writing

Specific applications of Writing Applications standards (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).

Specific applications of Writing Strategies and Applications standards (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.
- (1.4) Develop the main ideas within the body of the composition through supporting evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions).
- (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).
- (1.6) Integrate quotations and citations into a written text while maintaining the flow of ideas.
- (1.7) Use appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals (e.g., *Modern Language Association Handbook*, *The Chicago Manual of Style*).
- (1.8) Design and publish documents by using advanced publishing software and graphic programs.
- (1.9) Revise writing to improve the logic and coherence of the organization and controlling perspective, the precision of word choice, and the tone by taking into consideration the audience, purpose, and formality of the context.



- (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.
- (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.
- (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.

Specific applications of Writing Strategies and Applications standards (grades eleven and twelve):

- (1.1) Demonstrate an understanding of the elements of discourse (e.g., purpose, speaker, audience, form) when completing narrative, expository, persuasive, or descriptive writing assignments.
- (1.3) Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.
- (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).
- (1.8) Integrate databases, graphics, and spreadsheets into word-processed documents.

- (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.
- (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.

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### 2.3 *Written and Oral English Language Conventions*

Specific applications of English Language Conventions standards (grades nine and ten):

- (1.1) Identify and correctly use clauses (e.g., main and subordinate), phrases (e.g., gerund, infinitive, and participial), and mechanics of punctuation (e.g., semicolons, colons, ellipses, hyphens).
- (1.2) Understand sentence construction (e.g., parallel structure, subordination, proper placement of modifiers) and proper English usage (e.g., consistency of verb tenses).
- (1.3) Demonstrate an understanding of proper English usage and control of grammar, paragraph and sentence structure, diction, and syntax.
- (1.4) Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
- (1.5) Reflect appropriate manuscript requirements, including title page presentation, pagination, spacing and margins, and integration of source and support material (e.g., in-text citation, use of direct quotations, paraphrasing) with appropriate citations.

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### 2.4 *Listening and Speaking*

Specific applications of Listening and Speaking Strategies and Applications standards (grades nine and ten):

- (1.1) Formulate judgments about the ideas under discussion and support those judgments with convincing evidence.
- (1.2) Compare and contrast the ways in which media genres (e.g., televised news, news magazines, documentaries, online information) cover the same event.

- (1.3) Choose logical patterns of organization (e.g., chronological, topical, cause and effect) to inform and to persuade, by soliciting agreement or action, or to unite audiences behind a common belief or cause.
  - (1.7) Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.
  - (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.
  - (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.
- Specific applications of Speaking Applications standards (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.

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- 2.5 Understand the importance of effective nonverbal, oral, and written communication skills in getting and keeping a job.
  - 2.6 Use the appropriate vocabulary and specialized terminology of the industry.
  - 2.7 Understand verbal and nonverbal communication and respond appropriately.
  - 2.8 Understand trends and new information by reading and interpreting the professional literature of the professions within a selected career pathway.
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### 3.0 Career Planning and Management

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

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, 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.
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## 4.0 Technology

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

- 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.
  - 4.4 Use appropriate technology in the chosen career pathway.
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## 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:

- 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.
  - 5.4 Apply decision-making skills to achieve balance in the multiple roles of personal, home, work, and community life.
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## 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:

- 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.

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## 7.0 Responsibility and Flexibility

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

- 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.

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## 8.0 Ethics and Legal Responsibilities

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

- 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.

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## 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:

- 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, such as FHA-HERO, 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.

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## 10.0 Technical Knowledge and Skills (Consumer and Family Studies)

Students understand the essential knowledge and skills common to all pathways in the Education, Child Development, and Family Services sector:

- 10.1 Understand the decisions and responsibilities involved in parenting in various cultures.
- 10.2 Understand the stages of pregnancy, from conception through birth, and the implications of environment and heredity on the health and well-being of a child.
- 10.3 Understand the importance of studying child growth and development from infancy through adolescence.
- 10.4 Understand positive guidance and discipline techniques that promote feelings of self-worth as they apply to the developmental stages of children.
- 10.5 Understand the value and methods of providing infants, children, and adolescents with play and developmentally appropriate learning activities.
- 10.6 Understand the process of making consumer decisions, including the comparison of goods and services.
- 10.7 Understand how to manage financial resources to achieve personal and family goals.
- 10.8 Understand consumer resources, rights, and responsibilities and their relationship to the various levels of the economy.
- 10.9 Understand the function of the family as a basic unit of society and the contributions of the family unit to the development of individuals.
- 10.10 Understand the factors that affect the development of individuals and how to build positive relationships.
- 10.11 Understand the adjustments needed to adapt to major life changes throughout the human life cycle.
- 10.12 Understand strategies and resources for managing conflicts and crises.
- 10.13 Understand the importance of wellness and safety to individual and family health and well-being.
- 10.14 Understand how to prevent and control infection and disease to produce the optimum health of individuals and families.
- 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.
- 10.16 Assess the individual, family, and workplace factors that influence decisions at each stage of the human life cycle.
- 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.

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## 11.0 Demonstration and Application

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

## PATHWAY STANDARDS

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### A. Child Development Pathway

The Child Development Pathway is designed to prepare students to pursue a career in the field of child care and development for infants, toddlers, and young children. Students study child growth and development, safety and emergency procedures, nutrition and health practices, positive interaction and guidance techniques, learning theories, and developmentally appropriate practices and curriculum activities. Students apply this knowledge in a variety of early childhood programs, such as child development laboratories, public and private preschools, family day-care settings, and recreational facilities. Students completing the program may apply for the Child Development Assistant Permit from the California Commission on Teacher Credentialing.

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*A1.0 Students understand the essential aspects of the child care and development industry and the industry's role in state and local economies:*

- A1.1 Understand the effect of the child care and development industry on state and local economies.
  - A1.2 Know the legislative, economic, and social trends that affect the child care and development industry.
  - A1.3 Know the organizational structures in child care and development facilities.
  - A1.4 Know the functions and roles of the various careers in the child care and development industry.
  - A1.5 Understand the interdependence of various career roles and how those roles contribute to the success of the child care and development program or work site.
  - A1.6 Understand the legislative, economic, and social trends that affect the child care and development industry.
  - A1.7 Understand the components of professionalism and how to practice professional behaviors.
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*A2.0 Students understand and apply operational procedures and organizational policies at various child care and development facilities:*

- A2.1 Know the operational procedures at various types of facilities and explain their importance to the success of the organization.
- A2.2 Understand the operational policies and procedures related to child care and development program components (e.g., staff-child and staff-parent interaction, physical environment, health, safety, nutrition, and curriculum).
- A2.3 Understand the importance of, and procedures for, keeping child and classroom records and documentation.

- A2.4 Understand appropriate business systems that help with billing, ordering, budgeting, and collecting fees.
- A2.5 Explain the workforce management strategies that are effective for planning, making decisions, sharing responsibility, and negotiating.

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*A3.0 Students understand child care and development standards, licensing, regulations, and codes:*

- A3.1 Know the standards and licensing regulations for child care facilities.
- A3.2 Understand the educational and industry-related requirements for child care facilities staff.
- A3.3 Understand how local, state, and federal laws and regulations for child care facilities are enforced by regulatory agencies.
- A3.4 Know the health, safety, regulatory, and procedural requirements for the work site.
- A3.5 Understand the employer and employee responsibilities for complying with laws and regulations affecting the needs, interests, and rights of young children.
- A3.6 Know the indicators of child abuse or neglect and the responsibilities of staff as mandated reporters.

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*A4.0 Students understand and apply critical safety, emergency, and disaster procedures at the work site:*

- A4.1 Understand the state and federal environmental and safety regulations and the use of material safety data sheets as they relate to the child care and development industry.
- A4.2 Know the staff procedures, duties, and responsibilities related to safety, emergency, and disaster preparedness plans.
- A4.3 Know how and when to use certified first aid, cardiopulmonary resuscitation (CPR), and other emergency procedures.
- A4.4 Understand the typical hazards at the work site and know procedures and practices that contribute to a safe and healthy environment.

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*A5.0 Students understand important elements of a child's physical, intellectual, emotional, and social growth and development:*

- A5.1 Understand the biological and environmental factors that influence the development of infants, toddlers, and children.
- A5.2 Know the developmental stages of infants, toddlers, and children.
- A5.3 Understand the ways in which diversity, family, and culture influence the development of children.
- A5.4 Relate the importance of learning environments, experiences, and interactions and their connections to each stage of physical, intellectual, social, and emotional development.



- A5.5 Understand the importance of including infants, toddlers, and children with special needs.
- A5.6 Relate the benefits of parental involvement to the development of a child's physical, intellectual, emotional, and social growth and development.

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*A6.0 Students understand and apply the principles of positive interactions, guidance, and discipline in the workplace:*

- A6.1 Know how to help children develop a positive self-image and self-esteem and develop self-discipline and respect for oneself and others.
- A6.2 Understand the importance of building positive relationships between the caregiver, children, and families to provide effective guidance and discipline.
- A6.3 Know the elements of positive guidance and discipline techniques that are based on the stages of children's development.
- A6.4 Determine practical strategies for finding solutions to common behavioral problems.
- A6.5 Understand the staff's role in making adjustments to the environment that promote a child's independence and personal and social competence.

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*A7.0 Students understand and apply the essential components of an effective learning environment for the early childhood classroom:*

- A7.1 Understand the major learning theories and curriculum models and evaluate their application in early childhood education programs.
- A7.2 Know the components of an effective learning environment that reflects children's interests and developmental needs.
- A7.3 Know the early childhood education classroom learning areas and the contribution of each to the development of children.
- A7.4 Know multiple ways of promoting children's learning at different developmental stages and ages by using the continuum of teaching behaviors from directive to nondirective.
- A7.5 Use appropriate teaching techniques and interaction styles for working with children of varying ages, learning styles, and cultural backgrounds.
- A7.6 Know the ways in which classroom environments promote productive interaction among children and adults to create a positive atmosphere and sense of community.

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*A8.0 Students understand and apply developmentally appropriate practices for curriculum development:*

- A8.1 Understand the components of a developmentally appropriate curriculum in each area of the balanced, daily routine: indoor/outdoor, quiet/active, individual and small group/large group, large muscle/small muscle, and child-initiated and staff-initiated activities.

- A8.2 Plan and conduct activities that reinforce foundation skills, reflect an integrated and emergent curriculum, and support school readiness.
- A8.3 Observe children and document the observations in a factual and anecdotal format, tying observations to developmental milestones.

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*A9.0 Students understand and apply the principles and practices of good nutrition, health, and safety for infants and children:*

- A9.1 Know the procedures to clean a facility that follow a logical sequence and universal health precautions.
- A9.2 Understand the procedures for preventing the spread of infections and illnesses, including those for food-borne pathogens.
- A9.3 Understand the appropriate sanitation and hygiene techniques for infants, toddlers, children, and staff.
- A9.4 Know the proper procedures to follow when preparing and serving nutritional snacks and meals, including those that foster independent eating practices and promote good nutrition and hygiene habits.
- A9.5 Know how to recognize, describe, and report signs and symptoms of illness, injury, discomfort, or special needs in infants, toddlers, and children.

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*A10.0 Students understand how to communicate and interact effectively with families and communities:*

- A10.1 Understand the benefits of establishing strong relationships with families and communities.
- A10.2 Understand how language, culture, and educational backgrounds may affect family structures and communication within and among families and communities.
- A10.3 Know how positive parent-staff relationships, family members, and the community contribute to the physical, intellectual, social, and emotional development of the child.
- A10.4 Understand how to use opportunities in the daily routine to build trusting relationships and effective communication with families.
- A10.5 Understand how to be an advocate for high-quality programs and services for children and families.

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*A11.0 Students understand the role of teaching materials and resources in enhancing classroom instruction in child care and development programs:*

- A11.1 Understand the appropriate uses of current instructional technology and equipment to develop program materials and support learning.
- A11.2 Know the various types and sources of quality, age-appropriate, and developmentally appropriate materials and equipment.
- A11.3 Know how to select and develop age-appropriate and developmentally appropriate teaching materials and resources.

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*A12.0 Students understand and support the learning process in an assisting role:*

- A12.1 Know the strategies for supervising and maintaining a supportive learning environment for infants, toddlers, and children.
- A12.2 Understand the established standards and the established procedures in classrooms, libraries, halls, and bathrooms and on the school grounds.
- A12.3 Understand the typical learning challenges that students encounter in curricular areas.
- A12.4 Implement planned activities to facilitate multidisciplinary learning and reinforce concepts.
- A12.5 Understand how to provide instructional assistance to small and large learning groups.
- A12.6 Know how to help the teacher in assessing a child and developing a portfolio.

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## B. Consumer Services Pathway

The Consumer Services Pathway focuses on a broad-based curriculum designed to prepare students for careers helping customers, including credit counselors, consumer reporters, writers, and consumer affairs directors. Students learn employment and management skills that include business structure; consumer rights and responsibilities; testing and demonstration of products; consumer communications; and energy, environment, and resource management.

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*B1.0 Students understand important aspects of the consumer services industry and the role of the industry in state, local, and global economies:*

- B1.1 Know the ways in which national and international policies and procedures affect the daily operations of a consumer services organization.
- B1.2 Understand the legislative, economic, and social trends that affect careers in the consumer services industry.
- B1.3 Understand the effect of this industry on businesses and the state's economy.
- B1.4 Understand the ways in which industries, companies, and agencies provide consumer information and services.
- B1.5 Understand the role of consumer affairs personnel in an organization.

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*B2.0 Students understand the principles of effective workforce and organizational management, including the roles and responsibilities of management and employees:*

- B2.1 Understand the outcomes of effective management, such as profitability, productivity, consumer and client satisfaction, and business growth.
- B2.2 Understand the main workforce management strategies, such as shared responsibilities and negotiation.
- B2.3 Understand the interrelationship and interdependence of management and employees as they relate to workforce productivity.
- B2.4 Understand common organizational procedures and tools, such as business plans, spreadsheets for payroll and inventories, recordkeeping, and communication with consumers.

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*B3.0 Students understand the operational procedures and safety practices that are commonly used in the consumer services industry:*

- B3.1 Know the correct technical terms to describe products, procedures, and equipment specific to the consumer services industry.
- B3.2 Understand the procedures for preparing, expediting, and tracking forms needed for requisitioning supplies and materials.
- B3.3 Analyze the purpose of and information in material safety data sheets.

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*B4.0 Students understand essential consumer protection laws and regulations:*

- B4.1 Understand the evolution of consumer protection legislation.
- B4.2 Understand the role of local, state, and national public and private agencies in consumer and business protection.
- B4.3 Understand the effects of environmental laws and safety regulations on consumers.
- B4.4 Understand the legal implications of a contract and interpret the consequences of consumer actions related to various types of contracts.

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*B5.0 Students understand consumer rights and responsibilities in the consumer services industry:*

- B5.1 Understand the various advertising techniques that are used in marketing with respect to consumer rights.
- B5.2 Know how individuals can have an effect on the legislative process as it relates to consumer regulations.
- B5.3 Analyze the effect of consumer protection laws on the cost and quality of goods and services.
- B5.4 Know effective strategies that consumers can use when exercising their rights and accepting their responsibilities.
- B5.5 Understand the effects of identity theft on individuals, businesses, and local economies.

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*B6.0 Students understand the significance of national and international influences, current events, and diversity within the consumer services industry:*

- B6.1 Understand the national and international issues that affect consumers.
- B6.2 Analyze the influence of different global industries, economies, regulations, and political and economic systems on the consumer services industry.
- B6.3 Understand how cultural diversity affects consumer services.

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*B7.0 Students understand customer relationships and their impact on businesses and employees in the consumer services industry:*

- B7.1 Evaluate the factors that contribute to quality customer relationships.
- B7.2 Assess customer needs or desires and recommend products and services.
- B7.3 Apply logical, legal, and expedient solutions to consumer concerns.
- B7.4 Understand how the customer's point of view and suggestions affect management policies and decisions.
- B7.5 Understand how the Internet and new technology improve communication and facilitate business operations.
- B7.6 Understand the methods used to establish trust between a client and a customer service employee.

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*B8.0 Students understand and apply the skills and techniques needed to prepare advertising, public relations, and informational materials for consumers:*

- B8.1 Know the local, state, national, and international agencies, organizations, and media resources that provide current consumer information.
- B8.2 Know how to prepare and deliver materials and presentations that consumers will understand, such as videos, media kits, public service announcements, and fact sheets.
- B8.3 Know the tools and techniques used for communicating with consumers, including those used for advertising.
- B8.4 Understand how to prepare communications, timelines, agendas, schedules, meeting arrangements, and advertising media for public relations activities.
- B8.5 Analyze public relations plans in terms of their effect on customer relations and the operations of an organization.

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*B9.0 Students understand important consumer programs and services provided by energy, environmental, and resource management businesses:*

- B9.1 Know how to compare the costs and benefits of consumer programs for consumers, communities, and businesses.
- B9.2 Understand the various sources of energy available to consumers and the strategies that improve energy efficiency.
- B9.3 Understand residential and commercial waste disposal and recycling issues.

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*B10.0 Students understand and apply the basic procedures required to research, test, label, and demonstrate products to provide information needed by employees, consumers, and clients:*

- B10.1 Understand the trends that affect customer demand for products and services.
- B10.2 Understand the purpose of market research before a new product or service is developed and introduced.
- B10.3 Understand the standard testing procedures and strategies used to analyze data and integrate findings to revise products.
- B10.4 Know the industry standards and government regulations that require specific information to be included on labels and care instructions.
- B10.5 Compare features, benefits, prices, product information, styles, and performance of goods.
- B10.6 Plan, conduct, and evaluate demonstrations that educate consumers and promote a variety of products.

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*B11.0 Students understand personal financial management and its effects on the economy and career, personal, and family goals:*

- B11.1 Analyze budgets for a variety of individuals and families in accord with estimated income, needs, desires, goals, and lifestyles.

- B11.2 Understand the effects of short-term and long-term financial plans on consumer decisions.
- B11.3 Know credit terminology, credit ratings and sources, costs of credit, and risks and benefits of credit.
- B11.4 Understand the ways in which to resolve credit issues and explain the effect of credit issues on the consumer and the economy.
- B11.5 Understand the costs of bankruptcy to the individual, the consumer, the institution, and the economy.
- B11.6 Analyze various types of investments and risk-management programs.

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*B12.0 Students understand the effect of the U.S. economic system on personal income, financial management, individual and family security, and consumer decisions:*

- B12.1 Understand the interrelationship between the economy and consumer spending and saving.
- B12.2 Understand inflation and recession and how they affect the financial status of individuals and families.
- B12.3 Know the services provided by various financial institutions and departments of government.

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## C. Education Pathway

The Education Pathway is designed to prepare students for professional or learning support positions in education, prekindergarten through grade twelve. Students study human development; standards, regulations, and codes; positive guidance and counseling techniques; age-appropriate and grade-appropriate learning strategies; learning theories; and standards-based curriculum and instructional design. Students can apply and practice their knowledge and skills at a variety of elementary and secondary education sites.

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*C1.0 Students understand the structure of the education industry and its role in state and local economies:*

- C1.1 Understand the effect of the education industry on state and local economies.
- C1.2 Understand the legislative, economic, and social trends that affect the education industry.
- C1.3 Understand the basic structure of education in California (e.g., prekindergarten through grade twelve, community college, the California State University, the University of California).
- C1.4 Understand the differences in organizational structures at educational facilities, including relationships and interactions among personnel.

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*C2.0 Students understand and apply operational procedures and organizational policies at various levels in education:*

- 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).
- C2.2 Know the business procedures related to the acquisition of supplies and collection of fees.
- C2.3 Understand the main workforce management strategies in education (e.g., shared responsibility and negotiation).
- C2.4 Understand the components of professionalism and how to practice professional behaviors.

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*C3.0 Students understand specific applications of government regulations in the education industry:*

- C3.1 Know the critical health and safety procedures that are used at a school site.
- C3.2 Know the indicators of child abuse and neglect and the role of the mandated reporter.
- C3.3 Know the credentialing requirements for teachers of students in prekindergarten through community college.



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*C4.0 Students understand critical emergency and disaster procedures at a school site:*

- C4.1 Understand the state and federal environmental and safety regulations and the use of material safety data sheets as they relate to the education industry.
- C4.2 Know the staff procedures, duties, and responsibilities related to safety, emergency, and disaster preparedness plans.
- C4.3 Know how to use certified first aid, cardiopulmonary resuscitation (CPR), and other emergency procedures.
- C4.4 Understand the typical hazards at the work site and know the procedures and practices that contribute to a safe and healthy environment.

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*C5.0 Students understand important elements of the physical, intellectual, emotional, and social development of children and adolescents:*

- C5.1 Know how typical and common atypical developmental patterns affect the educational progress of children and adolescents.
- C5.2 Identify factors in heredity, family, culture, and environment that may influence the development of children and adolescents.
- C5.3 Understand the role of parental involvement in the physical, intellectual, emotional, and social development of children and adolescents.
- C5.4 Know the best educational practices for the inclusion of children and adolescents with special needs.

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*C6.0 Students understand the roles of positive interaction, guidance, and discipline in the educational environment:*

- C6.1 Understand common behavior problems, possible causes, and potential solutions.
- C6.2 Understand strategies for effective classroom management, including appropriate discipline.
- C6.3 Know the types of positive guidance techniques that are used in various stages of a child's development.
- 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.

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*C7.0 Students understand the role and purpose of standards-based instruction and assessment:*

- C7.1 Identify relevant curriculum standards and their use in instruction.
- C7.2 Know the basic components of effective standards-based lesson plans appropriate for varying ages, learning styles, and cultural backgrounds.
- C7.3 Use teaching strategies that promote student learning, critical thinking, and problem solving.
- C7.4 Know the types and important elements of student assessments.

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*C8.0 Students understand and apply basic principles and practices of good nutrition and health for children:*

- C8.1 Know the appropriate procedures for preventing the spread of infections and illnesses and for responding to allergic reactions.
- C8.2 Understand the nutritional needs of children and the allergies commonly associated with food.
- C8.3 Know crucial safety and sanitary procedures to follow in the classroom related to good nutrition and health.
- C8.4 Know the common indicators of nutrition-related disorders and diseases.

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*C9.0 Students understand how to communicate and interact effectively with families and community groups:*

- C9.1 Understand the factors that influence effective communication between the school and home and how to foster parental involvement.
- C9.2 Understand issues of diversity and how to exhibit sensitivity to cultural differences.
- C9.3 Understand the ways in which language, culture, and educational backgrounds may affect communication within and among families and the school.

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*C10.0 Students understand the process of developing quality teaching materials and resources for classroom instruction:*

- C10.1 Understand the appropriate use of current technology to develop instructional materials and support learning.
- C10.2 Know various types and sources of quality, grade-appropriate materials and equipment.
- C10.3 Assess available materials and resources for quality and grade appropriateness.
- C10.4 Develop grade-appropriate instructional materials and resources, including those that augment educational materials adopted by the State Board of Education.

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*C11.0 Students understand the role of instructional staff in supporting the learning process:*

- C11.1 Understand behavior standards expected of students (e.g., in classrooms, libraries, and bathrooms; on the school grounds; and during educational and recreational trips).
- C11.2 Know a variety of individual and group teaching strategies and learning theories that promote effective learning.
- C11.3 Understand the common typical and atypical learning challenges for students in a variety of curricular areas.
- C11.4 Know techniques for providing positive feedback on student work, attendance, and classroom performance.
- C11.5 Understand how to help the teacher with student instruction and assessment.

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*C12.0 Students understand the components of effective after-school and recreational programs for individuals and groups:*

C12.1 Know the purposes of after-school and recreational activities.

C12.2 Understand the important components and typical age-appropriate or ability-appropriate activities of various after-school and recreational programs.

C12.3 Assess the recreational interests and needs of individuals and groups.

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## D. Family and Human Services Pathway

Employment growth in the Family and Human Services Pathway will likely be driven by an increasing demand for family assistance. Students learn employment and management skills, such as positive guidance, professional behavior and standards, and laws and regulations related to the field. Students also learn about nutrition, health, and safety.

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*D1.0 Students understand important aspects of the family and human services industry and the role of the industry in local, state, and global economies:*

- D1.1 Understand the legislative, economic, and social trends that have an effect on careers in the family and human services industry.
- D1.2 Understand the ways in which agencies and organizations provide family and human services.
- D1.3 Understand the role and effect of this industry on individuals, families, and the state's economy.
- D1.4 Understand the organizational structure and hierarchy that shows the relationships and interactions among departments in both public and private sectors of this industry.

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*D2.0 Students understand the principles of effective workforce and organizational management, including the roles and responsibilities of management and employees:*

- D2.1 Understand the outcomes of effective management, such as profitability, productivity, positive work environment, and client satisfaction.
- D2.2 Understand the main workforce management strategies, such as shared responsibilities and negotiation.
- D2.3 Understand the interrelationship and interdependence of management and employees as they relate to workforce productivity.
- D2.4 Understand common organizational procedures and tools, such as business plans, spreadsheets for payroll and inventories, recordkeeping, and communication with consumers.
- D2.5 Know how to identify and gain access to various sources of funding for nonprofit organizations that serve individuals and families.

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*D3.0 Students understand the facilities and operational procedures used in the family and human services industry:*

- D3.1 Know the various types of care facilities that promote the independence of clients.
- D3.2 Evaluate facilities for the safety and well-being of clients.
- D3.3 Know the operational procedures related to quality control, inventory control, maintenance, storage, security, mailing, receiving, billing, and payment.
- D3.4 Understand various types of liability, insurance policies, code compliance, service agreements, and contracts.

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*D4.0 Students understand the laws and regulations that affect providers of family and human services and their clients:*

- D4.1 Know the local, state, and federal laws, regulations, and agencies established to protect children, adolescents, and adults, including the elderly and other persons with special needs.
- D4.2 Know the ways in which local, state, and federal regulations and laws are enforced by regulatory agencies (including the California Occupational Safety and Health Administration, the Americans with Disabilities Act, and the Health Insurance Portability and Accountability Act).
- D4.3 Understand the typical policies and procedures established by employers to comply with local, state, and federal regulations and laws.

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*D5.0 Students understand the stages of human development and the related needs of individuals and families:*

- D5.1 Understand the characteristics and changing needs of the various stages of development throughout the life span.
- D5.2 Know common needs, problems, and adjustments associated with life changes.
- D5.3 Understand the behaviors and resources that foster the well-being of individuals and families.
- D5.4 Understand the ways in which to enhance the emotional health of individuals and families.
- D5.5 Know how to determine the special needs of clients and identify resources and agencies that provide services.

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*D6.0 Students understand and apply the basic principles that promote health and well-being throughout the life span:*

- D6.1 Know the strategies that promote good health practices for all ages.
- D6.2 Plan and prepare snacks and meals that meet the dietary needs of persons, including those with special dietary needs, by using sanitary and safe food-handling procedures.
- D6.3 Evaluate foods in terms of their economic and nutritional value.
- D6.4 Plan exercise activities that are enjoyable, safe, and appropriate for the individual needs of clients.
- D6.5 Know how to recognize and describe signs and symptoms of illness and discomfort.

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*D7.0 Students understand important safety, emergency, and disaster procedures to use for a variety of populations:*

- D7.1 Understand how to establish and promote good safety habits for all ages.
- D7.2 Know the procedures for basic first aid and cardiopulmonary resuscitation (CPR) for infants, children, and adults.

- D7.3 Understand the causes and prevention of common accidents and injuries.
- D7.4 Know the correct procedures for dealing with emergencies and disasters.
- D7.5 Understand the procedures that prevent the spread of illnesses, infections, and diseases, including blood-borne pathogens.
- D7.6 Understand the specific health considerations of persons with disabilities.

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*D8.0 Students understand and apply interpersonal skills required to interact effectively with individuals and families:*

- D8.1 Know the strategies that promote positive interaction between individuals, families, and agencies.
- 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.
- D8.3 Understand effective ways to teach individuals and families communication, mediation, conflict-resolution, and decision-making skills.

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*D9.0 Students understand positive guidance and its application in helping individuals and families:*

- D9.1 Understand the concept of positive guidance and its benefits to persons across the life span.
- D9.2 Know positive guidance techniques that are appropriate for clients and that promote independence.
- D9.3 Understand possible causes of behavior problems and conflict and suggest solutions, including behavior modification.

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*D10.0 Students understand and facilitate daily living activities of individuals and families:*

- D10.1 Understand the importance of privacy, independence, dignity, confidentiality, and respect for clients.
- D10.2 Understand the importance of personal care and well-being to the physical and emotional health of clients.
- D10.3 Know the various types of disabilities, potential barriers, and types of accommodations needed for clients.
- D10.4 Know the tasks of daily living and the types of assistance persons need with these activities, including assistance for persons with special needs.
- D10.5 Know procedures for shopping, banking, and recordkeeping and other services that will assist clients.
- D10.6 Understand important consumer information, such as comparison shopping, disclosure on labels, warranties and guarantees, consumer fraud and identity theft, consumer redress, and consumer rights and responsibilities.

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*D11.0 Students understand common problems and crises affecting individuals and families:*

- D11.1 Know the signs of emotional and physical abuse, emotional crises, and mental health issues, such as depression, isolation, substance abuse, and stress.
- D11.2 Know how to identify behaviors that require intervention and outside assistance.
- D11.3 Know how to provide the information that individuals and families need to make decisions about seeking professional help.

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*D12.0 Students understand the importance of social involvement for individuals and families:*

- D12.1 Understand the value of social, recreational, and educational activities for all ages.
- D12.2 Know the processes for evaluating the appropriateness of facilities and community resources for social, recreational, and educational activities.
- D12.3 Plan, conduct, and evaluate social, recreational, and educational activities appropriate to the physical, psychological, cultural, and socioeconomic needs of individuals and families.
- D12.4 Recommend appropriate community resources for social, recreational, and educational activities to meet client needs.

The background of the page features a large, light gray watermark of the Seal of the State Board of Education of Alaska. The seal is circular and contains the text "BOARD OF EDUCATION" at the top and "ALASKA" at the bottom. In the center, there is a figure of a woman in traditional Alaskan dress holding a spear, and a bear standing on a patch of ground with a small house and a boat in the background. The seal is surrounded by a decorative border of stars and a rope-like pattern.

## Energy and Utilities Industry Sector

### *Career Pathways*

- ◆ Electromechanical Installation and Maintenance
- ◆ Energy and Environmental Technology
- ◆ Public Utilities
- ◆ Residential and Commercial Energy and Utilities





# Energy and Utilities Industry Sector

The Energy and Utilities sector is designed to provide a foundation in energy and utilities for all students in California. The pathways 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. The standards integrate academic and technical preparation and focus on career awareness, career exploration, and skill preparation in four pathways. The following components are integral to the Energy and Utilities sector pathways: classroom, laboratory, hands-on contextual learning, project- and work-based instruction, internship, community classroom, cooperative career technical education, and leadership development. The Energy and Utilities sector standards prepare students for continued training, postsecondary education, or entry to a career.

## FOUNDATION STANDARDS

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### 1.0 Academics

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

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, and history–social science content standards adopted by the State Board of Education.)*

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#### 1.1 Mathematics

Specific applications of Number Sense standards (grade seven):

- (1.1) Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.
- (1.2) Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

- (1.3) Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
- (1.4) Differentiate between rational and irrational numbers.
- (1.5) Know that every rational number is either a terminating or a repeating decimal and be able to convert terminating decimals into reduced fractions.
- (1.6) Calculate the percentage of increases and decreases of a quantity.
- (1.7) Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

Specific applications of Algebra and Functions standards (grade seven):

- (1.1) Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A).
- (3.4) Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.

Specific applications of Measurement and Geometry standards (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).
- (2.4) Relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches or  $[1 \text{ ft}^2] = [144 \text{ in}^2]$ , 1 cubic inch is approximately 16.38 cubic centimeters or  $[1 \text{ in}^3] = [16.38 \text{ cm}^3]$ ).

Specific applications of Mathematical Reasoning standards (grade seven):

- (2.1) Use estimation to verify the reasonableness of calculated results.
- (2.2) Apply strategies and results from simpler problems to more complex problems.
- (2.3) Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- (2.4) Make and test conjectures by using both inductive and deductive reasoning.
- (2.5) Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- (2.6) Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- (2.7) Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- (2.8) Make precise calculations and check the validity of the results from the context of the problem.
- (3.1) Evaluate the reasonableness of the solution in the context of the original situation.
- (3.2) Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.

- (3.3) Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.

Specific applications of Algebra I standards (grades eight through twelve):

- (1.1) Students use properties of numbers to demonstrate whether assertions are true or false.
- (5.0) Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
- (8.0) Students understand the concepts of parallel lines and perpendicular lines and how those slopes are related. Students are able to find the equation of a line perpendicular to a given line that passes through a given point.
- (12.0) Students simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.
- (15.0) Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.
- (24.1) Students explain the difference between inductive and deductive reasoning and identify and provide examples of each.

Specific applications of Geometry standards (grades eight through twelve):

- (11.0) Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.

Specific applications of Algebra II standards (grades eight through twelve):

- (6.0) Students add, subtract, multiply, and divide complex numbers.

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## 1.2 Science

Specific applications of Physics standards (grades nine through twelve):

- (3.a) Students know heat flow and work are two forms of energy transfer between systems.
- (3.g) Students know how to solve problems involving heat flow, work, and efficiency in a heat engine and know that all real engines lose some heat to their surroundings.
- (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.
- (5.b) Students know how to solve problems involving Ohm's law.

Specific applications of Investigation and Experimentation standards (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.

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### 1.3 History–Social Science

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (11.5) Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.
- (11.5.7) Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.
- (11.7) Students analyze America’s participation in World War II.
- (11.7.6) Describe major developments in aviation, weaponry, communication, and medicine and the war’s impact on the location of American industry and use of resources.
- (11.8) Students analyze the economic boom and social transformation of post-World War II America.
- (11.8.7) Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural technology.
- (11.11) Students analyze the major social problems and domestic policy issues in contemporary American society.
- (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.

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## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English–language arts content standards adopted by the State Board of Education.)*

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### 2.1 Reading

Specific applications of Reading Comprehension standards (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.
- (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).

Specific applications of Reading Comprehension standards (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.

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## 2.2 Writing

Specific applications of Writing Strategies standards (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.
- (1.4) Develop the main ideas within the body of the composition through supporting evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions).
- (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).
- (1.8) Design and publish documents by using advanced publishing software and graphic programs.

Specific applications of Writing Strategies and Applications standards (grades eleven and twelve):

- (1.8) Integrate databases, graphics, and spreadsheets into word-processed documents.
- (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.
- (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.

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## 2.3 Written and Oral English Conventions

Specific applications of English Language Conventions standards (grades nine and ten):

- (1.4) Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.

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#### 2.4 *Listening and Speaking*

Specific applications of Listening and Speaking Strategies and Applications standards (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
- (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.

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#### 2.5 *Multimedia*

Understand the importance of technical and computer-aided design and drawing technologies essential to the language of the energy and utilities industry, including reading, interpreting, and creating drawings, sketches, and schematics using energy and utilities industry conventions and standards; interpreting and understanding detailed information provided from available technical documents, both print and electronic, and from experienced people; and using computers, calculators, multimedia equipment, and other devices in a variety of applications.

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### 3.0 **Career Planning and Management**

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

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, 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.

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## 4.0 Technology

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

- 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.
- 4.4 Use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphic calculators) to perform tests, collect data, analyze relationships, and display data.
- 4.5 Understand the process of delivering a multimedia presentation.
- 4.6 Understand the effects of financial, technical, and economic trends on the energy and environmental technology industry.

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## 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:

- 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.
- 5.4 Understand the role of troubleshooting, research and development, invention, and experimentation in problem solving.
- 5.5 Know how to develop an energy and utilities sector product to given design parameters by using industry-specific materials, tools, equipment, and systems that meet end-use goals.

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## 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:

- 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.
- 6.3 Maintain safe and healthful working conditions and environments.
- 6.4 Use tools and machines safely and appropriately.

- 6.5 Understand the role and fundamental responsibilities of governmental safety agencies.
- 6.6 Know how to perform cardiopulmonary resuscitation (CPR) and basic first aid.

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## 7.0 Responsibility and Flexibility

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

- 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.
- 7.5 Understand the personal and time-management skills needed in a variety of workplace situations.
- 7.6 Understand the role of careful planning in producing desired results and accomplishing change.

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## 8.0 Ethics and Legal Responsibilities

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

- 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, including environmental awareness and responsibilities.

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## 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:

- 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, such as SkillsUSA, 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.
- 9.6 Understand how to organize, conduct, and participate in meetings.

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## 10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Energy and Utilities sector:

- 10.1 Select, use, adjust, and maintain tools, equipment, systems, and products common to the school energy and utilities instructional program in a safe, effective, and appropriate manner.
- 10.2 Know the common energy and power technologies.
- 10.3 Know the sources and systems of power and energy.
- 10.4 Know the energy resources currently in use or under research.
- 10.5 Know the basic theory of energy conversion processes and energy transmission systems and know their common applications.
- 10.6 Know the fundamentals of energy extraction processes and conserving and storing systems.
- 10.7 Use service resources, including print and electronic retrieval systems, to diagnose and solve technical problems.
- 10.8 Know the essential elements of a clearance and tagging program.
- 10.9 Understand the basic principles and proper selection and use of equipment designed for working in confined spaces and equipment designed for working at heights in a safe and appropriate manner.
- 10.10 Interpret material safety data sheets and locate information on hazardous materials.
- 10.11 Understand the fundamentals of lubricants and lubrication.
- 10.12 Understand the basic principles associated with the use of fasteners and the skills required in good bolting practices.
- 10.13 Understand the need to participate in sector-related professional improvement activities, SkillsUSA, other career technical education leadership and skill associations, and related career pathway specializations.
- 10.14 Comprehend complex details and specifications from both technical documentation and presentations.
- 10.15 Understand the need and process to obtain and maintain industry-standard, technical certifications and affiliations with professional organizations, including the American Gas Association and the Institute of Electrical and Electronic Engineers, Incorporated.

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## 11.0 Demonstration and Application

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

## PATHWAY STANDARDS

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### A. Electromechanical Installation and Maintenance Pathway

The Electromechanical Installation and Maintenance Pathway prepares students for employment or advanced training in a variety of electromechanical installation and maintenance industries.

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*A1.0 Students understand the advantages and disadvantages of energy resources currently in use or under research that influence or will influence electromechanical installation and maintenance industry systems and processes:*

- A1.1 Know the new and emerging energy resources in the industry.
  - A1.2 Know the advantages and disadvantages of energy resources used in the industry and the effects of those resources on the environment.
  - A1.3 Know the theory of basic plant electrical components.
  - A1.4 Know the fundamentals of cycles (including vapor and combined power, cogeneration, and Brayton and Rankin cycles) as they relate to energy resources used in the industry.
  - A1.5 Understand the operational fundamentals of basic industrial plants as they relate to energy resources used in the industry.
- 

*A2.0 Students understand energy conversion processes and energy transmission systems used in the electromechanical installation and maintenance industry:*

- A2.1 Know the basic physical and chemical terms, characteristics, and concepts related to process and systems operations and maintenance.
  - A2.2 Know the fundamentals of control systems and circuitry.
  - A2.3 Use a variety of rigging techniques in appropriate situations.
  - A2.4 Know the fundamentals of shaft couplings and shaft alignment.
  - A2.5 Know the fundamentals of basic electrical supply components.
  - A2.6 Understand basic process measurement systems.
- 

*A3.0 Students understand energy extraction processes, energy conservation systems, and energy storing in the electromechanical installation and maintenance industry:*

- A3.1 Know the practical operation of energy extraction processes, energy conservation systems, and energy.
- A3.2 Know the application of energy extraction processes, energy conservation systems, and energy storing methods in the industry as they relate to human needs.
- A3.3 Know the fundamentals of material characteristics, alloys, and testing.
- A3.4 Know the basic extraction, conservation, and storing applications of oxidation-reduction reactions and thermodynamics.
- A3.5 Know the basic principles of hydraulic, pneumatic, and electrical power.

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*A4.0 Students understand specific career preparation and planning requirements for employment in the electromechanical installation and maintenance industry and how these requirements apply to all students planning to enter and advance in the industry:*

- A4.1 Interpret scaled plant, circuit, and process drawings; perform calculations; and use resultant details to plan and produce components and systems that meet industry standards.
- A4.2 Know the processes used in controlling work scheduling and completion.
- A4.3 Understand a process used in controlling parts and equipment.
- A4.4 Understand the fundamentals of metallurgy and fluidics, including grain structure, hardness, flow control, and metering.

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*A5.0 Students understand procedures and processes as they occur in an electromechanical installation and maintenance project:*

- A5.1 Interpret written and oral maintenance and job specifications to plan and produce components, systems, and services that meet both customer needs and industry standards.
- A5.2 Estimate the materials to be used from the blueprints for projects and services.
- A5.3 Plan a sequence of events in a project.
- A5.4 Construct projects accurately from blueprints and specifications.
- A5.5 Solve common project problems by using construction codes, technical manuals, and building standards.
- A5.6 Understand the importance of and procedure for maintaining accurate records of the progress of a project.

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## B. Energy and Environmental Technology Pathway

The Energy and Environmental Technology Pathway prepares students for employment or advanced training in a variety of energy and environmental industries.

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*B1.0 Students understand energy resources and the effects of these resources and systems on the environment:*

- B1.1 Know how to classify various conventional energy resources by type: depletable, nondepletable, renewable, and nonrenewable.
  - B1.2 Know the new and emerging energy resources.
  - B1.3 Understand the advantages and disadvantages of energy resources in terms of the effects on the environment.
- 

*B2.0 Students understand the environmental implications of energy conversion processes and energy transmission systems:*

- B2.1 Know energy conversion processes and energy transmission systems as they relate to activities across the environment.
  - B2.2 Know the basic terms, characteristics, and concepts of physical and chemical processes related to components and systems operations and maintenance in energy conversion and transmission systems.
  - B2.3 Know the basic gas, electrical, and electronic terms, units, definitions, and concepts in energy conversion and transmission systems.
  - B2.4 Know the influences of three different energy conversion processes and energy transmission systems.
  - B2.5 Understand the basic principles of energy systems: chemical, hydraulic, pneumatic, electrical, nuclear, solar, wind, and geothermal.
  - B2.6 Understand basic energy production systems and components, including the main components and system flow-paths in energy conversion and transmission systems.
- 

*B3.0 Students understand the applications and environmental effects of energy extraction processes, energy conservation systems, and energy storing systems:*

- B3.1 Know the common energy extraction processes, energy conservation systems, and energy storage systems.
- B3.2 Understand the environmental implications of energy conservation principles related to energy extraction processes, conservation systems, and storage systems.
- B3.3 Understand the pragmatic applications of energy extraction processes, energy conservation systems, and energy storing methods.

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- B4.0 Students understand and apply specific career preparation and planning requirements for employment in the environmental technology industry and understand how these requirements apply across all standards for students planning to successfully enter and advance in the industry:*
- B4.1 Know the practical and theoretical applications of voltage, amperage, and resistance in electrical circuits and systems.
  - B4.2 Know fault analysis and the steps that lead to fault analysis.
  - B4.3 Interpret circuit, plant, process, and systems drawings and diagrams.
  - B4.4 Understand oil and gas exploration, extraction, distillation, and distribution processes and systems.
  - B4.5 Understand the essential elements of a chemical-control program.
  - B4.6 Understand the principles of an auditable calibration program in an energy or utilities context.

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## C. Public Utilities Pathway

The Public Utilities Pathway prepares students for employment or advanced training in a variety of opportunities in the public utilities industry.

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*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:*

- C1.1 Know the new and emerging energy resources used in the public utilities industry.
  - C1.2 Understand the advantages and disadvantages of energy resources used in the public utilities industry.
  - C1.3 Understand the effects of energy resource and conservation systems on the environment.
- 

*C2.0 Students understand the energy conversion processes and energy transmission systems used in the public utilities industry:*

- C2.1 Understand the application of energy conversion processes and energy transmission systems in the public utilities industry.
  - C2.2 Understand scientific principles (including mechanical, fluid, and thermodynamic) and chemical functions common to energy conversion processes and energy transmission systems.
  - C2.3 Understand the mathematical functions, including measurement scales, tables, and systems, used for safe energy conversion processes and energy transmission systems.
  - C2.4 Understand the basic principles of electricity and electrical power required of safe and economical energy conversion processes and energy transmission systems.
  - C2.5 Understand the basic principles of nuclear and other alternative power energy conversion processes and energy transmission systems used in the public utilities industry.
- 

*C3.0 Students understand energy extraction processes, energy conservation (e.g., residential) systems, and energy storing in the public utilities industry:*

- C3.1 Understand the energy extraction processes, energy conservation systems, and energy storing systems common to the public utilities industry.
- C3.2 Understand the application of energy extraction processes, energy conservation systems, and energy storing methods in the public utilities industry.
- C3.3 Know the various energy extraction processes, energy conservation systems, and energy storing methods used in the public utilities industry.
- C3.4 Understand the basic systems and components found in energy extraction processes, energy conservation systems, and energy storing methods.
- C3.5 Understand the theory and operation of basic electrical and electronic control, measurement, and monitoring components for energy extraction, energy conservation, and storage facilities.

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C4.0 *Students understand the effects of financial, technical, and economic trends on the past, current, and future technology in the public utilities industry:*

- C4.1 Understand the effects of financial, technical, and economic trends on the past, present, and future of the public utilities industry.
- C4.2 Understand the role of the public utilities industry in the local, state, and national community infrastructure.
- C4.3 Understand the effects of financial, technical, and economic trends on the development of systems and processes in the public utilities industry.

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C5.0 *Students understand the career preparation requirements for employment in the public utilities industry and how those requirements apply across all standards:*

- C5.1 Understand the basic pragmatic and theoretical applications of voltage, amperage, resistance, and heat transfer and flow in electrical and electronic circuits and equipment.
- C5.2 Understand the basic principles of pipelines, conveyors, elevators, and related alternative transport systems used in energy extraction processes, energy conservation systems, and energy storage.
- C5.3 Understand the concept of and need for maintenance and fault analysis skills and the related need and requirements for maintaining a calibration program in the public utilities industry.
- C5.4 Understand and interpret circuit, process, and structural drawings, diagrams, and blueprints used in the public utilities industry.
- C5.5 Understand the fundamentals of metallurgy associated with energy extraction processes, energy conservation systems, and energy storage.
- C5.6 Understand the basic concepts of heat transfer and flow.

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C6.0 *Students understand management procedures and processes as they occur in a public utilities industry project:*

- C6.1 Understand the use of blueprints in job estimation applications, maintenance planning and procedures, and job specification analysis for a public utilities industry project.
- C6.2 Use scheduling systems to plan sequences of events in public utilities industry projects.
- C6.3 Construct projects accurately from blueprints and specifications.
- C6.4 Use construction codes, technical manuals, electronic retrieval systems, and industry standards, such as American Gas Association standards, to solve common problems.
- C6.5 Understand one system supporting the maintenance of accurate records of the progress of a public utility project.
- C6.6 Understand the need for the production and use of industry-generated documents, records, and forms and the need for related management skills.

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C7.0 *Students understand the variety of building phases, systems, and techniques used in commercial and heavy construction in the public utilities industry:*

C7.1 Know how to develop building plans and schedules by using processes common to commercial and heavy construction in the public utilities industry.

C7.2 Understand the wide variety of tools, equipment, processes, materials, and knowledge and skills associated with the architectural design and development of commercial and heavy construction public utility projects.



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## D. Residential and Commercial Energy and Utilities Pathway

The Residential and Commercial Energy and Utilities Pathway prepares students for employment or advanced training in a variety of residential and commercial energy and utility industries.

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*D1.0 Students understand the advantages and disadvantages of energy resources (e.g., nonrenewable) currently in use or under research that influence or will influence the residential and commercial energy and utilities industry:*

- D1.1 Know the new and emerging energy resources used in residential and commercial energy and utilities.
  - D1.2 Know the advantages and disadvantages of energy resources used in residential and commercial industries in terms of their effects on the environment.
  - D1.3 Understand the basic principles of electricity and electrical power, including how electricity is generated and used as a power source.
- 

*D2.0 Students understand energy conversion processes and energy transmission systems used in residential and commercial industries:*

- D2.1 Understand the basic physical and chemical terms, characteristics, and concepts related to process and system operations.
  - D2.2 Use the appropriate electronic instruments to analyze, repair, and measure electric and electronic systems, circuits, and components.
  - D2.3 Understand the basic semiconductor physics and characteristics in circuit applications, including analog circuit basics and various forms of electromotive force.
  - D2.4 Understand the basic integrated circuit design, fabrication, and testing techniques in circuit applications.
  - D2.5 Understand the principles of electrical codes, wiring applications, and circuit and device troubleshooting techniques in circuit fabrications.
  - D2.6 Understand the principles of natural gas codes, distribution applications, and troubleshooting techniques in distribution systems.
- 

*D3.0 Students understand the role and function of tools and machines in residential and commercial industries:*

- 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.
- D3.2 Understand how tools, equipment, and machines may be used to safely measure, test, diagnose, and analyze relationships between voltage, current, resistance, power, gas and fluid pressure, and flow rate.
- D3.3 Know how tools, equipment, and machines may be used to safely measure, test, diagnose, and analyze tuned circuits, sine wave, and resonant and related characteristics of alternating current in alternating current applications.
- D3.4 Understand the consumer concepts (e.g., consumer rights and informed purchasing) that apply to the purchase of industrial products and materials.

- D3.5 Know the fundamental business aspects of the residential and commercial energy and utilities industry.
- D3.6 Know the basic principles of industry documents, records, and forms associated with the residential and commercial energy and utilities industry.
- D3.7 Know the importance of the business and consumer relationship and consumer rights concepts associated with the residential and commercial energy and utilities industry products and services.
- D3.8 Know the essential elements of a quality assurance system.

*D4.0 Students understand specific career preparation and planning requirements for employment in the residential and commercial energy and utilities industry and how these requirements apply across all standards for students planning to successfully enter and advance in the industry:*

- D4.1 Know gas, oil, electric, and electronic component codes and labeling.
- D4.2 Understand how electricity and electronics are composed of interactive, measurable forces.
- D4.3 Know the operation and application of circuits for low-voltage control signals.
- D4.4 Know the principles of electronic communication systems.
- D4.5 Know basic optoelectronic circuitry; the nature of light, light sources, and light amplification; and the integration of optical systems with electronic systems.
- D4.6 Know the principles of operation and the applications of transducers, sensors, and electronic and electromechanical controllers.

*D5.0 Students understand and apply procedures and processes related to a residential and commercial energy and utility project:*

- D5.1 Interpret information found in blueprints, maintenance and job specifications, and technical publications.
- D5.2 Know fabrication processes and how they are used in the industry.
- D5.3 Estimate needed materials by using blueprints, job specifications, and technical publications.
- D5.4 Know the process of project planning and maintenance.
- D5.5 Solve common problems by using technical manuals, electronic retrieval systems, construction codes, and industry standards, such as American Gas Association standards.
- D5.6 Know the importance of maintaining accurate records of the progress of a project.

*D6.0 Students understand the value and necessity of practicing occupational safety in the residential and commercial energy and utilities industry:*


- D6.1 Know the basic fire hazards in the energy and utilities industry.
- D6.2 Understand the elements of combustion, fire classifications, and fire-fighting equipment and techniques specific to the residential and commercial energy and utilities industry.
- D6.3 Know the basic theory and concepts of electrostatics.



# Engineering and Design Industry Sector

## *Career Pathways*

- ◆ Architectural and Structural Engineering
- ◆ Computer Hardware, Electrical, and Networking Engineering
- ◆ Engineering Design
- ◆ Engineering Technology
- ◆ Environmental and Natural Science Engineering



# Engineering and Design Industry Sector

The Engineering and Design sector is designed to provide a foundation in engineering and design for students in California. 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. The following pathways emphasize real-world, occupationally relevant experiences of significant scope and depth: Architectural and Structural Engineering; Computer Hardware, Electrical, and Networking Engineering; Engineering Design; Engineering Technology; and Environmental and Natural Science Engineering. 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; internship, community classroom, and cooperative career technical education; work experience education; and leadership and interpersonal skills development.

## FOUNDATION STANDARDS

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### 1.0 Academics

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

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, history–social science, and visual and performing arts content standards adopted by the State Board of Education.)*

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#### 1.1 Mathematics

Specific applications of Number Sense standards (grade seven):

- (1.1) Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.

- (1.2) Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
- (1.3) Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
- (1.4) Differentiate between rational and irrational numbers.
- (1.5) Know that every rational number is either a terminating or a repeating decimal and be able to convert terminating decimals into reduced fractions.
- (1.6) Calculate the percentage of increases and decreases of a quantity.
- (1.7) Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

Specific applications of Mathematical Reasoning standards (grade seven):

- (2.1) Use estimation to verify the reasonableness of calculated results.
- (2.2) Apply strategies and results from simpler problems to more complex problems.
- (2.3) Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- (2.4) Make and test conjectures by using both inductive and deductive reasoning.
- (2.5) Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- (2.6) Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- (2.7) Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- (2.8) Make precise calculations and check the validity of the results from the context of the problem.
- (3.1) Evaluate the reasonableness of the solution in the context of the original situation.
- (3.2) Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- (3.3) Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.

Specific applications of Algebra I standards (grades eight through twelve):

- (1.1) Students use properties of numbers to demonstrate whether assertions are true or false.
- (2.0) Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.
- (3.0) Students solve equations and inequalities involving absolute values.
- (5.0) Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.

(12.0) Students simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.

(15.0) Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.

Specific applications of Geometry standards (grades eight through twelve):

(15.0) Students use the Pythagorean theorem to determine distance and find missing lengths of sides of right triangles.

(19.0) Students use trigonometric functions to solve for an unknown length of a side of a right triangle, given an angle and a length of a side.

Specific applications of Algebra II standards (grades eight through twelve):

(3.0) Students are adept at operations on polynomials, including long division.

(6.0) Students add, subtract, multiply, and divide complex numbers.

## 1.2 Science

Specific applications of Physics standards (grades nine through twelve):

(3.a) Students know heat flow and work are two forms of energy transfer between systems.

(3.b) Students know that the work done by a heat engine that is working in a cycle is the difference between the heat flow into the engine at high temperature and the heat flow out at a lower temperature (first law of thermodynamics) and that this is an example of the law of conservation of energy.

(3.c) Students know the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as *thermal energy*. The greater the temperature of the object, the greater the energy of motion of the atoms and molecules that make up the object.

(3.g) Students know how to solve problems involving heat flow, work, and efficiency in a heat engine and know that all real engines lose some heat to their surroundings.

Specific applications of Investigation and Experimentation standards (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.

(1.d) Formulate explanations by using logic and evidence.

(1.l) Analyze situations and solve problems that require combining and applying concepts from more than one area of science.

## 1.3 History–Social Science

Specific applications of World History, Culture, and Geography: The Modern World standards (grade ten):

(10.3) Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.

- (10.3.5) Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (11.5) Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.
- (11.5.4) Analyze the passage of the Nineteenth Amendment and the changing role of women in society.
- (11.5.7) Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.
- (11.7) Students analyze America's participation in World War II.
- (11.7.6) Describe major developments in aviation, weaponry, communication, and medicine and the war's impact on the location of American industry and use of resources.
- (11.8) Students analyze the economic boom and social transformation of post-World War II America.
- (11.8.7) Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural technology.

Specific applications of Principles of Economics standards (grade twelve):

- (12.1) Students understand common economic terms and concepts and economic reasoning.
- (12.1.1) Examine the causal relationship between scarcity and the need for choices.
- (12.1.2) Explain opportunity cost and marginal benefit and marginal cost.
- (12.1.3) Identify the difference between monetary and nonmonetary incentives and how changes in incentives cause changes in behavior.
- (12.1.4) Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.
- (12.1.5) Analyze the role of a market economy in establishing and preserving political and personal liberty (e.g., through the works of Adam Smith).
- (12.2) Students analyze the elements of America's market economy in a global setting.
- (12.2.1) Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.
- (12.2.2) Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.
- (12.2.3) Explain the roles of property rights, competition, and profit in a market economy.
- (12.2.4) Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.
- (12.2.5) Understand the process by which competition among buyers and sellers determines a market price.

- (12.2.6) Describe the effect of price controls on buyers and sellers.
- (12.2.7) Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.
- (12.2.8) Explain the role of profit as the incentive to entrepreneurs in a market economy.
- (12.2.9) Describe the functions of the financial markets.
- (12.2.10) Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.
- (12.3) Students analyze the influence of the federal government on the American economy.
  - (12.3.1) Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.
  - (12.3.2) Identify the factors that may cause the costs of government actions to outweigh the benefits.
  - (12.3.3) Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.
  - (12.3.4) Understand the aims and tools of monetary policy and their influence on economic activity (e.g., the Federal Reserve).
- (12.4) Students analyze the elements of the U.S. labor market in a global setting.
  - (12.4.1) 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.
  - (12.4.2) Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.
  - (12.4.3) Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.
  - (12.4.4) Explain the effects of international mobility of capital and labor on the U.S. economy.
- (12.6) Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States's borders.
  - (12.6.1) Identify the gains in consumption and production efficiency from trade, with emphasis on the main products and changing geographic patterns of twentieth-century trade among countries in the Western Hemisphere.
  - (12.6.2) Compare the reasons for and the effects of trade restrictions during the Great Depression compared with present-day arguments among labor, business, and political leaders over the effects of free trade on the economic and social interests of various groups of Americans.



- (12.6.3) Understand the changing role of international political borders and territorial sovereignty in a global economy.
- (12.6.4) Explain foreign exchange, the manner in which exchange rates are determined, and the effects of the dollar's gaining (or losing) value relative to other currencies.

#### 1.4 *Visual and Performing Arts*

Specific applications of Visual Arts standards at the advanced level (grades nine through twelve):

- (1.1) Analyze and discuss complex ideas, such as distortion, color theory, arbitrary color, scale, expressive content, and real versus virtual in works of art.
- (1.3) Analyze their works of art as to personal direction and style.
- (1.7) Select three works of art from their art portfolio and discuss the intent of the work and the use of the media.
- (2.3) Assemble and display objects or works of art as a part of a public exhibition.
- (2.4) Demonstrate in their own works of art a personal style and an advanced proficiency in communicating an idea, theme, or emotion.
- (2.5) Use innovative visual metaphors in creating works of art.
- (2.6) Present a universal concept in a multimedia work of art that demonstrates knowledge of technology skills.
- (3.1) Identify contemporary styles and discuss the diverse social, economic, and political developments reflected in the works of art examined.
- (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.
- (3.3) Investigate and discuss universal concepts expressed in works of art from diverse cultures.
- (4.3) Analyze and articulate how society influences the interpretation and message of a work of art.
- (4.6) Develop written criteria for the selection of a body of work from their portfolios that represents significant achievements.
- (5.1) Speculate on how advances in technology might change the definition and function of the visual arts.
- (5.3) Prepare portfolios of their original works of art for a variety of purposes (e.g., review for postsecondary application, exhibition, job application, and personal collection).

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## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English–language arts content standards adopted by the State Board of Education.)*

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### 2.1 Reading

Specific applications of Reading Comprehension standards (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.
- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (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).

Specific applications of Reading Comprehension standards (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.
- 

### 2.2 Writing

Specific applications of Writing Strategies standards (grade eight):

- (1.4) Plan and conduct multiple-step information searches by using computer networks and modems.
- (1.5) Achieve an effective balance between researched information and original ideas.
- (1.6) Revise writing for word choice; appropriate organization; consistent point of view; and transitions between paragraphs, passages, and ideas.

Specific applications of Writing Strategies and Applications standards (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.
- (1.4) Develop the main ideas within the body of the composition through supporting evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions).
- (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).
- (1.7) Use appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals (e.g., *Modern Language Association Handbook*, *The Chicago Manual of Style*).

- (1.8) Design and publish documents by using advanced publishing software and graphic programs.
- (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.

Specific applications of Writing Strategies and Applications standards (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).
- (1.8) Integrate databases, graphics, and spreadsheets into word-processed documents.
- (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.
- (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.

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### 2.3 *Written and Oral English Language Conventions*

Specific applications of English Language Conventions standards (grades eleven and twelve):

- (1.1) Demonstrate control of grammar, diction, and paragraph and sentence structure and an understanding of English usage.
- (1.2) Produce legible work that shows accurate spelling and correct punctuation and capitalization.
- (1.3) Reflect appropriate manuscript requirements in writing.

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## 2.4 *Listening and Speaking*

Specific applications of Listening and Speaking Strategies and Applications standards (grade eight):

- (1.1) Analyze oral interpretations of literature, including language choice and delivery, and the effect of the interpretations on the listener.
- (1.2) Paraphrase a speaker's purpose and point of view and ask relevant questions concerning the speaker's content, delivery, and purpose.
- (1.3) Organize information to achieve particular purposes by matching the message, vocabulary, voice modulation, expression, and tone to the audience and purpose.
- (1.4) Prepare a speech outline based upon a chosen pattern of organization, which generally includes an introduction; transitions, previews, and summaries; a logically developed body; and an effective conclusion.
- (1.5) Use precise language, action verbs, sensory details, appropriate and colorful modifiers, and the active rather than the passive voice in ways that enliven oral presentations.
- (1.6) Use appropriate grammar, word choice, enunciation, and pace during formal presentations.
- (1.7) Use audience feedback (e.g., verbal and nonverbal cues):
  - a. Reconsider and modify the organizational structure or plan.
  - b. Rearrange words and sentences to clarify the meaning.
- (1.8) Evaluate the credibility of a speaker (e.g., hidden agendas, slanted or biased material).
- (1.9) Interpret and evaluate the various ways in which visual image makers (e.g., graphic artists, illustrators, news photographers) communicate information and affect impressions and opinions.
- (2.1) Deliver narrative presentations (e.g., biographical, autobiographical):
  - a. Relate a clear, coherent incident, event, or situation by using well-chosen details.
  - b. Reveal the significance of, and the subject's attitude about, the incident, event, or situation.
  - c. Employ narrative and descriptive strategies (e.g., relevant dialogue, specific action, physical description, background description, comparison or contrast of characters).
- (2.2) Deliver oral responses to literature:
  - a. Interpret a reading and provide insight.
  - b. Connect the students' own responses to the writer's techniques and to specific textual references.
  - c. Draw supported inferences about the effects of a literary work on its audience.
  - d. Support judgments through references to the text, other works, other authors, or personal knowledge.

- (2.3) Deliver research presentations:
  - a. Define a thesis.
  - b. Record important ideas, concepts, and direct quotations from significant information sources and paraphrase and summarize all relevant perspectives on the topic, as appropriate.
  - c. Use a variety of primary and secondary sources and distinguish the nature and value of each.
  - d. Organize and record information on charts, maps, and graphs.
- (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.
- (2.5) Recite poems (of four to six stanzas), sections of speeches, or dramatic soliloquies, using voice modulation, tone, and gestures expressively to enhance the meaning.

Specific applications of Listening and Speaking Strategies and Applications standards (grades nine and ten):

- (1.7) Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.
- (1.8) Produce concise notes for extemporaneous delivery.
- (1.12) Evaluate the clarity, quality, effectiveness, and general coherence of a speaker's important points, arguments, evidence, organization of ideas, delivery, diction, and syntax.
- (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.

- (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.

Specific applications of Listening and Speaking Strategies and Applications standards (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).
- (1.8) Use effective and interesting language, including:
- a. Informal expressions for effect
  - b. Standard American English for clarity
  - c. Technical language for specificity
- (1.10) Evaluate when to use different kinds of effects (e.g., visual, music, sound, graphics) to create effective productions.
- (2.2) Deliver oral reports on historical investigations:
- a. Use exposition, narration, description, persuasion, or some combination of those to support the thesis.
  - b. Analyze several historical records of a single event, examining critical relationships between elements of the research topic.
  - c. Explain the perceived reason or reasons for the similarities and differences by using information derived from primary and secondary sources to support or enhance the presentation.
  - d. Include information on all relevant perspectives and consider the validity and reliability of sources.
- (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.

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### 2.5 *Multimedia*

Understand the importance of technical and computer-aided design and drawing technologies essential to the language of the engineering and design industry, including reading, writing, interpreting, and creating drawings, sketches, and schematics using engineering and design industry conventions and standards; interpreting and understanding detailed information provided from available technical documents, both print and electronic, and from experienced people; and using computers, calculators, multimedia equipment, and other devices in a variety of applications.

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## 3.0 Career Planning and Management

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

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in a career.
- 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.
- 3.7 Understand the nature of entrepreneurial activities.

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## 4.0 Technology

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

- 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.

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## 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:

- 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.

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## 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:

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

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## 7.0 Responsibility and Flexibility

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

- 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.

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## 8.0 Ethics and Legal Responsibilities

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

- 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.



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## 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:

- 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, such as SkillsUSA, 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.
- 9.6 Understand how to organize, conduct, lead, and participate in student-centered activities and events through student-based organizations.

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## 10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Engineering and Design sector:

- 10.1 Use and maintain industrial and technological products and systems.
- 10.2 Understand the importance of technical and computer-aided technologies essential to the language of the engineering and design industry.
- 10.3 Understand how to use, adjust, maintain, and troubleshoot the equipment and tools of the engineering and design industry in a safe, effective, and efficient manner.
- 10.4 Acquire, store, allocate, and use materials and space efficiently.
- 10.5 Understand the role of the engineering and design industry in the California economy.
- 10.6 Understand and apply the appropriate use of quality control systems and procedures.
- 10.7 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.
- 10.8 Understand the need to obtain and maintain industry-standard, technical certifications significant to a particular industry.

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## 11.0 Demonstration and Application

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

## PATHWAY STANDARDS

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### A. Architectural and Structural Engineering Pathway

The Architectural and Structural Engineering Pathway provides learning opportunities for students interested in preparing for careers in such areas as architecture, industrial design, and civil engineering.

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*A1.0 Students understand the ways in which architecture is shaped by history and know significant events in the history of structural engineering:*

- A1.1 Know significant historical architectural and structural projects and their effects on society.
  - A1.2 Understand the development of architectural and structural systems in relation to aesthetics, efficiency, and safety.
- 

*A2.0 Students understand the theoretical, practical, and contextual issues that influence design:*

- A2.1 Understand the ways in which sociocultural conditions and issues influence architectural design.
  - A2.2 Understand the theoretical and practical effects of human and physical factors and cost analysis on the development of architectural designs.
  - A2.3 Use the necessary equipment for producing an architectural design and the appropriate methods and techniques for employing the equipment.
  - A2.4 Use freehand graphic communication skills to represent conceptual ideas, analysis, and design concepts.
- 

*A3.0 Students understand the relationship between architecture and the external environment:*

- A3.1 Understand the influence of community context and zoning requirements on architectural design.
  - A3.2 Develop a site analysis that considers passive energy techniques, sustainability issues, and landscaping.
  - A3.3 Develop a preliminary proposal for a simulated architectural design.
  - A3.4 Develop a complete set of architectural plans and drawings.
- 

*A4.0 Students understand the mechanics and properties of structural materials:*

- A4.1 Understand the integration of architectural factors, such as soil mechanics, foundation design, engineering materials, and structure design.
- A4.2 Understand various forces that bear on and within structures, including axial force, shear, torsion, and moment.
- A4.3 Know the various components of structures, including lighting; heating, ventilating, and air-conditioning (HVAC); mechanical; electrical; plumbing; communication; security; and vertical transportation systems.

- A4.4 Develop a stress analysis chart of a typical structural component.
  - A4.5 Evaluate available building materials (e.g., steel and wood) by considering their properties and their effect on building form.
  - A4.6 Develop a preliminary building plan by using the appropriate materials.
- 

*A5.0 Students understand methods used to analyze simple structures:*

- A5.1 Understand load transfer mechanisms.
  - A5.2 Understand stress-strain relationships of building structures.
  - A5.3 Understand structural design considerations, including load-bearing relationships of shear walls, columns, and beams.
  - A5.4 Design a simple structure by using structural analysis principles.
- 

*A6.0 Students understand the use of computer-aided drafting and design (CADD) in developing architectural designs:*

- A6.1 Know various CADD programs that are commonly used in architectural design.
  - A6.2 Use CADD software to develop a preliminary architectural proposal.
- 

*A7.0 Students understand how to systematically complete an architectural project:*

- A7.1 Develop, read, and understand architectural and construction plans, drawings, diagrams, and specifications.
  - A7.2 Estimate the materials needed for a project by reading an architectural drawing.
  - A7.3 Plan the sequence of events leading to an architectural project.
  - A7.4 Develop a process to record the progress of a project.
- 

*A8.0 Students understand the methods of creating both written and digital portfolios:*

- A8.1 Develop a binder of representative student work for presentation.
  - A8.2 Produce a compact disc, Web site, or other digital-media portfolio.
  - A8.3 Give an effective oral presentation of a portfolio.
- 

*A9.0 Students understand the effective use of architectural and structural equipment:*

- A9.1 Use the appropriate methods and techniques for employing all architectural and structural equipment.
- A9.2 Apply conventional architectural and structural processes and procedures accurately, appropriately, and safely.
- A9.3 Apply the concepts of architectural and structural engineering to the tools, equipment, projects, and procedures of the Architectural and Structural Engineering Pathway.

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## B. Computer Hardware, Electrical, and Networking Engineering Pathway

The Computer Hardware, Electrical, and Networking Engineering Pathway provides learning opportunities for students interested in preparing for careers in the assembly, manufacturing, programming, design, production, and maintenance of information technology, computer, telecommunications, and networking systems.

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*B1.0 Students know how to communicate and interpret information clearly in industry-standard visual and written formats:*

- B1.1 Understand the classification and use of various electronic components, symbols, abbreviations, and media common to electronic drawings.
  - B1.2 Plan, prepare, and interpret mechanical, civil, chemical, and electrical sketches and drawings.
  - B1.3 Know the current industry standards for illustration and layout.
  - B1.4 Understand, organize, and complete network diagrams by using information collected from detailed drawings.
  - B1.5 Draw flat layouts of a variety of objects by using the correct drafting tools, techniques, and media.
  - B1.6 Prepare reports and data sheets for writing specifications.
- 

*B2.0 Students understand the telecommunications systems, such as electromagnetic, fiber optic, and digital, that apply to the transmission of data:*

- B2.1 Understand how to confirm operating parameters, apply test procedures, make necessary adjustments, and assemble the components of a telecommunications system or subsystem.
  - B2.2 Understand how to plan, install, and maintain copper and fiber optic cabling for telecommunications systems.
  - B2.3 Test and maintain wireless communications components and systems.
  - B2.4 Understand how to safely operate various data networking and telecommunications systems.
- 

*B3.0 Students know the fundamentals of the theory, measurement, control, and applications of electrical energy, including alternating and direct currents:*

- B3.1 Analyze relationships between voltage, current, resistance, and power related to direct current (DC) circuits.
- B3.2 Understand the characteristics of alternating current (AC) and how AC is generated; the characteristics of the sine wave; the basic characteristics of AC circuits, tuned circuits, and resonant circuits; and the nature of the frequency spectrum.
- B3.3 Calculate, construct, measure, and interpret both AC and DC circuits.
- B3.4 Understand the fabrication processes and how they are applied in the electronics industry.

- B3.5 Use appropriate electronic instruments to analyze, repair, or measure electrical and electronic systems, circuits, or components.
- B3.6 Analyze and predict the effects of circuit conditions on the basis of measurements and calculations of voltage, current, resistance, and power.

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*B4.0 Students understand computer systems and solve computer-related problems from an engineering perspective:*

- B4.1 Understand how to design and assemble systems that use computer programs to interact with hardware.
- B4.2 Install and configure essential computer hardware and software components.
- B4.3 Understand the ethical issues in computer engineering.
- B4.4 Know the function and interaction of basic computer components and peripherals.
- B4.5 Understand the relationship among computer hardware, networks, and operating systems.
- B4.6 Understand the process of assembling, testing, and troubleshooting computer equipment and systems.
- B4.7 Use utility software and test equipment efficiently to diagnose and correct problems.

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*B5.0 Students understand the design process and how to solve analysis and design problems:*

- B5.1 Understand the steps in the design process.
- B5.2 Determine what information and principles are relevant to a problem and its analysis.
- B5.3 Choose between alternate solutions in solving a problem and be able to justify the choices made in determining a solution.
- B5.4 Translate word problems into mathematical statements when appropriate.
- B5.5 Understand the process of incorporating multiple details into a single solution.
- B5.6 Build a prototype from plans and test it.
- B5.7 Evaluate and redesign a prototype on the basis of collected test data.

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*B6.0 Students understand the principles of data systems networking (e.g., design, configuration, topology, and implementation):*

- B6.1 Understand the terminology used in the design, assembly, configuration, and implementation of data systems networks.
- B6.2 Know the fundamental elements of the major networking models established by the industry standards of recognized organizations (e.g., the Open System Interconnect [OSI] or transmission-control/Internet protocol [TCP/IP] models).
- B6.3 Know how data are carried through the most common network media.
- B6.4 Understand the composition and function of the various networks, including local area networks (LANs), medium area networks (MANs), and wide area networks (WANs).

- B6.5 Use the major routing and addressing protocols used in networking.
- B6.6 Understand the characteristics, advantages, and disadvantages of the various networking presentation functions (e.g., data formatting, data encryption, and data compression).
- B6.7 Know the characteristics of networking hardware and applications and the methods to implement them.
- B6.8 Design and document data systems networks.

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*B7.0 Students understand how to define a network security plan:*

- B7.1 Know the common potential threats to networks and ways to neutralize them.
- B7.2 Know the main functions of and installation protocols for firewalls, virus detection software, and other security measures.
- B7.3 Upgrade and patch operating systems as necessary.
- B7.4 Define and configure firewalls.
- B7.5 Detect and remove virus and worm threats.
- B7.6 Use a management plan to develop an acceptable-use policy.

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*B8.0 Students understand fundamental automation modules and know how to set up simple systems to complete preprogrammed tasks:*

- B8.1 Use appropriate tools and technology to install equipment, assemble hardware, perform tests, collect data, analyze relationships, and display data in a simulated or modeled automated system.
- B8.2 Understand the use of sensors for data collection and process correction in an automated system.
- B8.3 Understand how to program a computing device to control an automated system or process.

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*B9.0 Students understand the effective use of computer and networking equipment:*

- B9.1 Use methods and techniques for employing all computer and networking equipment appropriately.
- B9.2 Apply conventional computer and networking processes and procedures accurately, appropriately, and safely.
- B9.3 Apply the concepts of computer and networking equipment to the tools, equipment, projects, and procedures of the Computer Hardware, Electrical, and Networking Engineering Pathway.

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## C. Engineering Design Pathway

The Engineering Design Pathway provides learning opportunities for students interested in preparing for careers in the design and production of visual communications. The students plan, prepare, and interpret drawings and models through traditional drafting or computer-aided drafting and design (CADD) techniques.

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*C1.0 Students recognize historical and current events related to engineering design and their effects on society:*

- C1.1 Know historical and current events that have relevance to engineering design.
  - C1.2 Understand the development of graphic language in relation to engineering design.
- 

*C2.0 Students understand the effective use of engineering design equipment:*

- C2.1 Use the appropriate methods and techniques for employing all engineering design equipment.
  - C2.2 Apply conventional engineering design processes and procedures accurately, appropriately, and safely.
  - C2.3 Apply the concepts of engineering design to the tools, equipment, projects, and procedures of the Engineering Design Pathway.
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*C3.0 Students understand measurement systems as they apply to engineering design:*

- C3.1 Know how the various measurement systems are used in engineering drawings.
  - C3.2 Understand the degree of accuracy necessary for engineering design.
- 

*C4.0 Students use proper projection techniques to develop orthographic drawings:*

- C4.1 Understand the commands and concepts necessary for producing drawings through traditional or computer-aided means.
  - C4.2 Understand the orthographic projection process for developing multiview drawings.
  - C4.3 Understand the various techniques for viewing objects.
  - C4.4 Use the concepts of geometric construction in the development of design drawings.
  - C4.5 Apply pictorial drawings derived from orthographic multiview drawings and sketches and from a solid modeler.
- 

*C5.0 Students know various object-editing techniques and CADD programs:*

- C5.1 Understand the commands and concepts necessary for editing engineering drawings.
- C5.2 Know the various object-altering techniques.
- C5.3 Know the CADD components and the operational functions of CADD systems.

- C5.4 Apply two-dimensional and three-dimensional CADD operations in creating working and pictorial drawings, notes, and notations.
- C5.5 Understand how to determine properties of drawing objects.

*C6.0 Students understand and apply proper dimensioning to drawings:*

- C6.1 Know a variety of drafting applications and understand the proper dimensioning styles for each.
- C6.2 Apply dimensioning to various objects and features.
- C6.3 Edit a dimension by using various editing methods.

*C7.0 Students understand sectional view applications and functions:*

- C7.1 Understand the function of sectional views.
- C7.2 Use a sectional view and appropriate cutting planes to clarify hidden features of an object.

*C8.0 Students understand the tolerance relationships between mating parts:*

- C8.1 Understand what constitutes mating parts in engineering design.
- C8.2 Use tolerancing in an engineering drawing.
- C8.3 Interpret geometric tolerancing symbols in a drawing.

*C9.0 Students understand the methods of inserting text into a drawing:*

- C9.1 Understand the processes of lettering and text editing.
- C9.2 Develop drawings using notes and specifications.
- C9.3 Understand the methods of title block creation.

*C10.0 Students understand the sketching process used in concept development:*

- C10.1 Understand the process of producing proportional two- and three-dimensional sketches and designs.
- C10.2 Use sketching techniques as they apply to a variety of architectural and engineering models.
- C10.3 Use freehand graphic communication skills to represent conceptual ideas, analysis, and design concepts.

*C11.0 Students understand the methods of creating both written and digital portfolios:*

- C11.1 Develop a binder of representative student work for presentation.
- C11.2 Produce a compact disc, Web site, or other digital-media portfolio.
- C11.3 Know how to give an effective oral presentation of a portfolio.



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## D. Engineering Technology Pathway

The Engineering Technology Pathway provides learning opportunities for students interested in preparing for careers in the design, production, and maintenance of mechanical, telecommunications, electrical, electronics, and electromechanical products and systems.

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*D1.0 Students know how to communicate and interpret information clearly in industry-standard visual and written formats:*

- D1.1 Understand the classification and use of various electronic components, symbols, abbreviations, and media common to electronic drawings.
  - D1.2 Understand, organize, and complete an assembly drawing by using information collected from detailed drawings.
  - D1.3 Know the current industry standards for illustration and layout.
  - D1.4 Draw flat layouts of a variety of objects by using the correct drafting tools, techniques, and media.
  - D1.5 Prepare reports and data sheets for writing specifications.
- 

*D2.0 Students understand telecommunications systems, such as electromagnetic, fiber optic, and digital, that apply to the transmission of data:*

- D2.1 Assemble the components of a telecommunications system or subsystem, including confirming operating parameters, applying test procedures, and making necessary adjustments.
  - D2.2 Plan, install, and maintain copper and fiber optic cabling for telecommunications systems.
  - D2.3 Test and maintain wireless communications components and systems.
  - D2.4 Understand how to safely operate various data networking and telecommunications systems.
- 

*D3.0 Students know the fundamentals of the theory, measurement, control, and applications of electrical energy, including alternating and direct currents:*

- D3.1 Analyze relationships between voltage, current, resistance, and power related to direct current (DC) circuits.
- D3.2 Understand the characteristics of alternating current (AC) and how it is generated; the characteristics of the sine wave; the basic characteristics of AC circuits, tuned circuits, and resonant circuits; and the nature of the frequency spectrum.
- D3.3 Calculate, construct, measure, and interpret both AC and DC circuits.
- D3.4 Use appropriate electronic instruments to analyze, repair, or measure electrical and electronic systems, circuits, or components.
- D3.5 Analyze and predict the effects of circuit conditions on the basis of measurements and calculations of voltage, current, resistance, and power.
- D3.6 Classify and use various electrical components, symbols, abbreviations, media, and standards of electrical drawings.

- D3.7 Understand how electrical control and protection devices are used in electrical systems.
  - D3.8 Calculate loads, currents, and circuit-operating parameters.
- 

*D4.0 Students understand how the principles of force, work, rate, power, energy, and resistance relate to mechanical, electrical, fluid, and thermal engineering systems:*

- D4.1 Understand scalars and vectors.
  - D4.2 Solve problems by using the concept of vectoring to predict the resultant forces.
  - D4.3 Know the six simple machines and their applications.
  - D4.4 Know how energy is transferred; know the effects of resistance in mechanical, electrical, fluid, and thermal systems.
  - D4.5 Solve problems by using the appropriate units applied in mechanical, electrical, fluid, and thermal engineering systems.
- 

*D5.0 Students understand the design process and how to solve analysis and design problems:*

- D5.1 Understand the steps in the design process.
  - D5.2 Determine what information and principles are relevant to a problem and its analysis.
  - D5.3 Choose between alternate solutions in solving a problem and be able to justify the choices made in determining a solution.
  - D5.4 Translate word problems into mathematical statements when appropriate.
  - D5.5 Understand the process of developing multiple details into a single solution.
  - D5.6 Build a prototype from plans and test it.
  - D5.7 Evaluate and redesign a prototype on the basis of collected test data.
- 

*D6.0 Students understand industrial engineering processes, including the use of tools and equipment, methods of measurement, and quality assurance:*

- D6.1 Know the common structure and processes of a quality assurance cycle.
  - D6.2 Understand the major manufacturing processes.
  - D6.3 Use tools, fasteners, and joining systems employed in selected engineering processes.
  - D6.4 Estimate and measure the size of objects in both Standard International and United States units.
  - D6.5 Calibrate and measure objects by using precision measurement tools and instruments.
- 

*D7.0 Students understand the concepts of physics that are fundamental to engineering technology:*

- D7.1 Understand Newton's laws and how they affect and define the movement of objects.
- D7.2 Understand how the laws of conservation of energy and momentum provide a way to predict and describe the movement of objects.

- D7.3 Analyze the fundamentals and properties of waveforms and how waveforms may be used to carry energy.
- D7.4 Understand how electric and magnetic phenomena are related and know common practical applications.

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*D8.0 Students understand computer systems and solve computer-related problems from an engineering perspective:*

- D8.1 Understand how to design systems that use computer programs to interact with hardware.
- D8.2 Install and configure the main computer hardware and software components.
- D8.3 Understand the ethical issues in computer engineering.
- D8.4 Know the function and interaction of basic computer components and peripherals.
- D8.5 Understand the relationship among computer hardware, networks, and operating systems.
- D8.6 Understand the process of testing and troubleshooting computer equipment and systems.
- D8.7 Use utility software efficiently to diagnose and correct problems.

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*D9.0 Students understand fundamental automation modules and are able to develop systems that complete preprogrammed tasks:*

- D9.1 Use appropriate tools and technology to perform tests, collect data, analyze relationships, and display data in a simulated or modeled automated system.
- D9.2 Understand the use of sensors for data collection and process correction in an automated system.
- D9.3 Program a computing device to control an automated system or process.
- D9.4 Use motors, solenoids, and similar devices as output mechanisms in automated systems.
- D9.5 Assemble input, processing, and output devices to create an automated system capable of accurately completing a preprogrammed task.

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*D10.0 Students understand the fundamentals of systems and products as they are developed and released to production and marketing:*

- D10.1 Understand the process of product development.
- D10.2 Understand charting and the use of graphic tools in illustrating the development of a product and the processes involved.

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*D11.0 Students understand the effective use of engineering technology equipment:*

- D11.1 Use methods and techniques for employing all engineering technology equipment appropriately.
- D11.2 Apply conventional engineering technology processes and procedures accurately, appropriately, and safely.
- D11.3 Apply the concepts of engineering technology to the tools, equipment, projects, and procedures of the Engineering Technology Pathway.

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## E. Environmental and Natural Science Engineering Pathway

The Environmental and Natural Science Engineering Pathway provides students with the opportunity to prepare for careers in the environmental and natural sciences. They learn to design and develop processes, equipment, and systems that are used to create, monitor, prevent, or correct environmental events and conditions.

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*E1.0 Students know how to communicate and interpret information clearly in industry-standard visual and written formats:*

- E1.1 Understand the classification and use of various electronic components, symbols, abbreviations, and media common to electronic drawings.
  - E1.2 Know the current industry standards for illustration and layout.
  - E1.3 Organize and complete site plans.
- 

*E2.0 Students study and understand the fundamentals of earth science as they relate to environmental engineering:*

- E2.1 Classify the three major groups of rocks according to their origin on the basis of texture and mineral composition.
  - E2.2 Analyze the importance and use of soil, and evaluate how soil may be preserved and conserved.
  - E2.3 Know how to assess and evaluate geological hazards.
  - E2.4 Understand how to read, interpret, and evaluate topographical maps and images.
  - E2.5 Use global positioning systems equipment and related technology to locate and evaluate soil or geological conditions or features.
  - E2.6 Analyze soil erosion and identify the causes.
  - E2.7 Know the fundamental stages of geochemical cycles.
  - E2.8 Understand the effects of pollution on hydrological features.
- 

*E3.0 Students understand the effects of the weather, the hydrosphere, and the atmosphere on the environment:*

- E3.1 Understand the effects of weather fronts on regional air pollution.
- E3.2 Know the common causes of atmospheric contamination.
- E3.3 Analyze atmospheric pressure and weather systems.
- E3.4 Know the major systems used to monitor, analyze, and predict conditions of meteorological events.
- E3.5 Analyze the mechanisms for air mass movement.
- E3.6 Understand the relationship between the health of the marine environment and climate control.
- E3.7 Understand the effects of human activity on the atmospheric environment.

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- E4.0 Students understand how the principles of force, work, rate, power, energy, and resistance relate to mechanical, electrical, fluid, and thermal engineering systems:*
- E4.1 Understand scalars and vectors.
  - E4.2 Solve problems by using the concept of vectoring to predict the resultant forces.
  - E4.3 Know the six simple machines and their applications.
  - E4.4 Know how energy is transferred and the effects of resistance in mechanical, electrical, fluid, and thermal systems.
  - E4.5 Solve problems by using the appropriate units applied in mechanical, electrical, fluid, and thermal engineering systems.
- 
- E5.0 Students understand the design process and how to solve analysis and design problems:*
- E5.1 Understand the steps in the design process.
  - E5.2 Determine what information and principles are relevant to a problem and its analysis.
  - E5.3 Choose between alternate solutions in solving a problem and be able to justify choices in determining a solution.
  - E5.4 Translate word problems into mathematical statements when appropriate.
  - E5.5 Understand the process of developing multiple details into a single solution.
  - E5.6 Build a prototype from plans and test it.
  - E5.7 Evaluate and redesign a prototype on the basis of collected test data.
- 
- E6.0 Students understand the concepts of physics that are fundamental to engineering technology:*
- E6.1 Understand Newton's laws and how they affect and define the movement of objects.
  - E6.2 Understand how the laws of conservation of energy and momentum provide a way to predict and describe the movement of objects.
  - E6.3 Analyze the fundamentals and properties of waveforms and how waveforms may be used to carry energy.
  - E6.4 Understand how electric and magnetic phenomena are related and know common practical applications.
- 
- E7.0 Students understand how computer hardware and software are combined to create systems and process information and data:*
- E7.1 Use computer programs to interact with sensors and monitor equipment.
  - E7.2 Install and configure the main computer hardware and software components.
  - E7.3 Understand ethical issues in computer engineering.
  - E7.4 Know the function and interaction of basic computer components and peripherals.
  - E7.5 Understand the relationship among computer hardware, networks, and operating systems.

- E7.6 Understand the process of testing and troubleshooting computer equipment and systems.
- E7.7 Use utility software efficiently to diagnose and correct problems.

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*E8.0 Students understand fundamental automation modules and know how to set up simple systems that will complete preprogrammed tasks:*

- E8.1 Use appropriate tools and technology to perform tests, collect data, analyze relationships, and display data in a simulated or modeled automated system.
- E8.2 Understand the use of sensors for data collection and process correction in an automated system.
- E8.3 Understand how to program a computing device to control an automated system or process.
- E8.4 Assemble input, processing, and output devices to create an automated system that is capable of accurately completing a preprogrammed task.

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*E9.0 Students understand the effective use of environmental and natural science equipment:*

- E9.1 Use appropriate methods and techniques for employing environmental and natural science equipment.
- E9.2 Apply conventional environmental and natural science processes and procedures accurately, appropriately, and safely.
- E9.3 Apply the concepts of environmental and natural science to the tools, equipment, projects, and procedures of the Environmental and Natural Science Engineering Pathway.

The background of the page features a large, light gray watermark of the Seal of the Board of Education of the State of Alaska. The seal is circular and contains the text "BOARD OF EDUCATION" at the top and "STATE OF ALASKA" at the bottom. The central figure is a woman in traditional Alaskan dress, holding a spear. Below her are various symbols representing different aspects of Alaskan life and industry, including a bear, a fish, and a miner.

## **Fashion and Interior Design Industry Sector**

### *Career Pathways*

- ◆ Fashion Design, Manufacturing, and Merchandising
- ◆ Interior Design, Furnishings, and Maintenance



# Fashion and Interior Design Industry Sector

The Fashion and Interior Design sector contains two career pathways: Fashion Design, Manufacturing, and Merchandising; and Interior Design, Furnishings, and Maintenance. To meet the growing needs of this industry, the career pathways prepare students with the knowledge, skills, and attitude necessary to pursue related careers and succeed in entry-level positions or pursue additional postsecondary education and training for technical and professional-level positions. The pathways include introductory standards for Consumer and Family Studies that lead to the other pathway standards. The standards are designed to integrate academic concepts with career technical concepts. Key components of the pathways support classroom and laboratory instruction or supervised work-based learning experiences and leadership development.

## FOUNDATION STANDARDS

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### 1.0 Academics

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

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, history–social science, and visual and performing arts content standards adopted by the State Board of Education.)*

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#### 1.1 Mathematics

Specific applications of Number Sense standards (grade seven):

- (1.1) Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.
- (1.2) Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
- (1.3) Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.



- (1.4) Differentiate between rational and irrational numbers.
- (1.5) Know that every rational number is either a terminating or a repeating decimal and be able to convert terminating decimals into reduced fractions.
- (1.6) Calculate the percentage of increases and decreases of a quantity.
- (1.7) Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

Specific applications of Mathematical Reasoning standards (grade seven):

- (1.1) Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
- (2.1) Use estimation to verify the reasonableness of calculated results.
- (2.2) Apply strategies and results from simpler problems to more complex problems.
- (2.3) Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- (2.4) Make and test conjectures by using both inductive and deductive reasoning.
- (2.5) Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- (2.6) Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- (2.7) Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- (2.8) Make precise calculations and check the validity of the results from the context of the problem.
- (3.1) Evaluate the reasonableness of the solution in the context of the original situation.
- (3.2) Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- (3.3) Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.

Specific applications of Algebra I standards (grades eight through twelve):

- (1.1) Students use properties of numbers to demonstrate whether assertions are true or false.
- (13.0) Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.
- (24.1) Students explain the difference between inductive and deductive reasoning and identify and provide examples of each.
- (24.2) Students identify the hypothesis and conclusion in logical deduction.
- (24.3) Students use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.

Specific applications of Geometry standards (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.
- 

### 1.2 Science

Specific applications of Chemistry standards (grades nine through twelve):

- (1.a) Students know how to relate the position of an element in the periodic table to its atomic number and atomic mass.
- (1.b) Students know how to use the periodic table to identify metals, semimetals, nonmetals, and halogens.
- (2.a) Students know atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds.
- (5.a) Students know the observable properties of acids, bases, and salt solutions.
- (5.d) Students know how to use the pH scale to characterize acid and base solutions.

Specific applications of Investigation and Experimentation standards (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.
  - (1.d) Formulate explanations by using logic and evidence.
  - (1.m) Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.
- 

### 1.3 History–Social Science

Specific applications of Chronological and Spatial Thinking standards (grades nine through twelve):

- (1) Students compare the present with the past, evaluating the consequences of past events and decisions and determining the lessons that were learned.
- (2) Students analyze how change happens at different rates at different times; understand that some aspects can change while others remain the same; and understand that change is complicated and affects not only technology and politics but also values and beliefs.

Specific applications of Historical Interpretation standards (grades nine through twelve):

- (1) Students show the connections, causal and otherwise, between particular historical events and larger social, economic, and political trends and developments.

Specific applications of World History, Culture, and Geography: The Modern World standards (grade ten):

- (10.11) Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (11.8) Students analyze the economic boom and social transformation of post-World War II America.
- (11.8.7) Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural technology.

Specific applications of Principles of Economics standards (grade twelve):

- (12.1) Students understand common economic terms and concepts and economic reasoning.
  - (12.1.1) Examine the causal relationship between scarcity and the need for choices.
  - (12.1.2) Explain opportunity cost and marginal benefit and marginal cost.
  - (12.1.3) Identify the difference between monetary and nonmonetary incentives and how changes in incentives cause changes in behavior.
- (12.2) Students analyze the elements of America's market economy in a global setting.
  - (12.2.1) Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.
  - (12.2.2) Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.
  - (12.2.3) Explain the roles of property rights, competition, and profit in a market economy.
  - (12.2.4) Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.
  - (12.2.5) Understand the process by which competition among buyers and sellers determines a market price.
  - (12.2.6) Describe the effect of price controls on buyers and sellers.
  - (12.2.7) Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.
  - (12.2.8) Explain the role of profit as the incentive to entrepreneurs in a market economy.
- (12.3) Students analyze the influence of the federal government on the American economy.
  - (12.3.3) Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.
- (12.4) Students analyze the elements of the U.S. labor market in a global setting.
  - (12.4.1) 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.
  - (12.4.2) Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.

- (12.4.3) Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.
- (12.4.4) Explain the effects of international mobility of capital and labor on the U.S. economy.
- (12.6) Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States's borders.
- (12.6.3) Understand the changing role of international political borders and territorial sovereignty in a global economy.
- (12.6.4) Explain foreign exchange, the manner in which exchange rates are determined, and the effects of the dollar's gaining (or losing) value relative to other currencies.

#### 1.4 *Visual and Performing Arts*

Specific applications of Visual Arts standards at the proficient level (grades nine through twelve):

- (1.1) Identify and use the principles of design to discuss, analyze, and write about visual aspects in the environment and in works of art, including their own.
- (1.2) Describe the principles of design as used in works of art, focusing on dominance and subordination.
- (1.3) Research and analyze the work of an artist and write about the artist's distinctive style and its contribution to the meaning of the work.
- (2.1) Solve a visual arts problem that involves the effective use of the elements of art and the principles of design.
- (3.1) Identify similarities and differences in the purposes of art created in selected cultures.
- (3.3) Identify and describe trends in the visual arts and discuss how the issues of time, place, and cultural influence are reflected in selected works of art.
- (4.1) Articulate how personal beliefs, cultural traditions, and current social, economic, and political contexts influence the interpretation of the meaning or message in a work of art.
- (5.2) Create a work of art that communicates a cross-cultural or universal theme taken from literature or history.

Specific applications of Visual Arts standards at the advanced level (grades nine through twelve):

- (1.1) Analyze and discuss complex ideas, such as distortion, color theory, arbitrary color, scale, expressive content, and real versus virtual in works of art.
- (1.6) Describe the use of the elements of art to express mood in one or more of their works of art.
- (2.2) Plan and create works of art that reflect complex ideas, such as distortion, color theory, arbitrary color, scale, expressive content, and real versus virtual.
- (2.3) Assemble and display objects or works of art as part of a public exhibition.

- (2.4) Demonstrate in their own works of art a personal style and an advanced proficiency in communicating an idea, theme, or emotion.
- (3.1) Identify contemporary styles and discuss the diverse social, economic, and political developments reflected in the works of art examined.
- (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.
- (3.3) Investigate and discuss universal concepts expressed in works of art from diverse cultures.
- (5.3) Prepare portfolios of their original works of art for a variety of purposes (e.g., review for postsecondary application, exhibition, job application, and personal collection).

## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English-language arts content standards adopted by the State Board of Education.)*

### 2.1 Reading

Specific applications of Reading Comprehension standards (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.
- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (2.3) Generate relevant questions about readings on issues that can be researched.
- (2.7) Critique the logic of functional documents by examining the sequence of information and procedures in anticipation of possible reader misunderstandings.

Specific applications of Reading Comprehension standards (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.

### 2.2 Writing

Specific applications of Writing Strategies and Applications standards (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.

- (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).
- (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.
- (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.
- (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.

Specific applications of Writing Strategies and Applications standards (grades eleven and twelve):

- (1.5) Use language in natural, fresh, and vivid ways to establish a specific tone.
- (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).
- (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.

### 2.3 *Listening and Speaking*

Specific applications of Speaking Applications standards (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.

Specific applications of Speaking Applications standards (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.

- 2.4 Understand the importance of effective nonverbal, oral, and written communication skills in obtaining and keeping a job.
- 2.5 Use appropriate communication skills, appropriate vocabulary, and the specialized terminology of the industry.
- 2.6 Understand verbal and nonverbal communication and respond appropriately.
- 2.7 Understand trends and new ideas by reading and interpreting the professional literature of the fashion and interior design industry.

## 3.0 Career Planning and Management

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

- 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.

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## 4.0 Technology

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

- 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.
- 4.4 Use appropriate technology in the chosen career pathway.

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## 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:

- 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.
- 5.4 Understand how individuals apply decision-making skills to achieve balance in the multiple roles of personal, work, and community life.

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## 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:

- 6.1 Know 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.

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## 7.0 Responsibility and Flexibility

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

- 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.

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## 8.0 Ethics and Legal Responsibilities

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

- 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.

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## 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:

- 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, such as FHA-HERO, 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.

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## 10.0 Technical Knowledge and Skills (Consumer and Family Studies)

Students understand the essential knowledge and skills common to all pathways in the Fashion and Interior Design sector:

- 10.1 Understand how apparel and interior fashions meet social, physical, and psychological needs of individuals and families.
- 10.2 Understand the elements and principles of design and color theory as they apply to the selection of apparel, furnishings, and housing.
- 10.3 Understand the historical and cultural influences on apparel, furnishings, and housing.
- 10.4 Understand the characteristics of different textile fibers, fabrics, and finishes used for apparel and furnishings.
- 10.5 Understand how to construct, alter, and repair fashion and interior items and accessories through the use of basic construction techniques and equipment.
- 10.6 Understand the principles of wardrobe planning and maintenance and the factors that influence a person's apparel budget.
- 10.7 Understand the factors that influence housing decisions.
- 10.8 Understand factors influencing the selection and care of home furnishings, accessories, and equipment.
- 10.9 Understand the principles and factors that influence space planning and interior design, including universal access.
- 10.10 Understand how individuals apply strategies that enable them to manage personal and work responsibilities to enhance productivity in the workplace.
- 10.11 Assess the factors regarding the individual, the family, and the workplace that influence decisions related to apparel and housing at each stage of the life cycle.
- 10.12 Understand how knowledge, skills, attitudes, and behaviors learned in consumer and family studies can be transferred to advanced training and education or careers in the Fashion and Interior Design sector.

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## 11.0 Demonstration and Application

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

## PATHWAY STANDARDS

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### A. Fashion Design, Manufacturing, and Merchandising Pathway

The Fashion Design, Manufacturing, and Merchandising Pathway focuses on the major aspects of the fashion industry. Students pursuing this career pathway have in-depth, hands-on experiences that focus on industry awareness, the elements and principles of design, the history of fashion, fashion forecasting, textiles and textile products, product knowledge, apparel merchandising, and garment construction.

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*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:*

- A1.1 Understand how the various segments of the industry contribute to local, state, national, and international economies.
  - A1.2 Know how such resources as periodicals, mass media, and the Internet are used in the industry.
  - A1.3 Recognize major legislative, economic, and social trends that affect the industry.
- 

*A2.0 Students understand basic operational procedures and regulatory requirements in the fashion design, manufacturing, merchandising, and retail industry:*

- A2.1 Know basic operational procedures for all aspects of the industry (e.g., quality control, inventory control, maintenance, storage, security, shipping, receiving, billing, and payment).
  - A2.2 Know what constitutes appropriate professional clothing, grooming, and personal hygiene for a variety of professions.
  - A2.3 Understand the importance of accurate and thorough documentation to various aspects of the industry.
- 

*A3.0 Students understand the principles of effective workforce and organizational management, including the roles and responsibilities of management and employees:*

- A3.1 Understand the major outcomes of effective management, such as profitability, productivity, a positive work environment, and client satisfaction.
- A3.2 Understand important workforce management strategies, such as shared responsibilities and negotiation.
- A3.3 Understand the interrelationship and interdependence of management and employees as they relate to workforce productivity.
- A3.4 Understand common organizational procedures and tools, such as business plans, spreadsheets for payroll and inventories, recordkeeping, and communication with consumers.
- A3.5 Understand the effects of various workforce management strategies on employees' actions, attitude, and productivity.
- A3.6 Understand how the use of technology has affected the fashion design, manufacturing, merchandising, and retail industry.

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A4.0 *Students understand and apply the elements and principles of design in various aspects of the fashion industry:*

- A4.1 Understand the elements and principles of design and their interrelationships.
- A4.2 Understand the concept of universal design and relate it to the industry.
- A4.3 Apply the elements and principles of design to designing, marketing, and merchandising.
- A4.4 Understand the fundamentals of color theory and color forecasting.
- A4.5 Use various types of technology in the design process.

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A5.0 *Students understand the relationship between history and fashion:*

- A5.1 Analyze fashion trends in various periods throughout history, and analyze the influences of art and media on fashion.
- A5.2 Understand how fashion and design have been influenced by politics, society, economics, culture, and aesthetics.
- A5.3 Understand how designs and trends have developed and evolved throughout history.
- A5.4 Analyze the ways in which economies, mass production, labor unions, and technology affect the fashion industry.
- A5.5 Understand fashion cycles and the adaptation of historical fashions to current trends.

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A6.0 *Students understand the characteristics, production, and maintenance of textiles and textile products:*

- A6.1 Know the general characteristics and maintenance of various fibers, yarns, fabrics, and finishes.
- A6.2 Know textile manufacturing methods for producing fabrics that are woven, nonwoven, and knit.
- A6.3 Know the characteristics of standard types of print design (e.g., abstract and geometric) and color designs (e.g., tone-on-tone, positive/negative, and mono-tone).
- A6.4 Know the skills and procedures necessary to create and produce textiles.
- A6.5 Know how technology is used to create various characteristics in textiles.
- A6.6 Understand how copyright laws affect textile design and production.

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A7.0 *Students understand how trends and color forecasting are used in the development of new lines:*

- A7.1 Know the resources available to the fashion industry that provide information on fashion trends and color forecasting.
- A7.2 Research fashion and color trends.
- A7.3 Evaluate forecasting information for usefulness in the analysis of retail trends.
- A7.4 Know the procedures for developing a line (e.g., researching trends and preparing sketches, color plates, and presentation boards).

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*A8.0 Students understand the principles of pattern making and techniques for draping to produce a pattern for apparel design:*

- A8.1 Understand flat pattern design, draping techniques, and the use of the basic block.
- A8.2 Evaluate the draping qualities of various fabrics.
- A8.3 Know how technology is used in pattern making, grading, and marking.
- A8.4 Evaluate first-sample garments made from first patterns and determine necessary adjustments.
- A8.5 Use pattern specifications for global production.

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*A9.0 Students understand and apply garment construction skills used in a variety of occupations within the industry:*

- A9.1 Know the basic process of manufacturing garments.
- A9.2 Understand the effects of global sourcing on garment production.
- A9.3 Use a variety of equipment, tools, supplies, and software to construct or manufacture garments.
- A9.4 Understand how the manufacturing process relates to the cost of producing garments.
- A9.5 Understand cost sheets for garments, including manufacturer's costs, markup, and profit margin.
- A9.6 Understand common fitting challenges of various figure types and determine related costs.

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*A10.0 Students understand the skills and procedures necessary for sales and marketing in the fashion industry:*

- A10.1 Know the factors that contribute to quality customer relations, service, and sales.
- A10.2 Evaluate the impact of cultural factors on customers' needs, desires, and satisfaction.
- A10.3 Analyze sales and marketing techniques for effectiveness.
- A10.4 Know strategies for helping customers select merchandise and recommend related services appropriate to their needs (e.g., budget, personality, figure type, coloring, and personal preference).
- A10.5 Know how technology can be used to provide customer service and follow-up.
- A10.6 Know basic procedures for sales, exchanges, and returns.

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*A11.0 Students understand and apply the procedures necessary to produce and maintain interior and exterior store displays:*

- A11.1 Know the characteristics of effective interior and exterior retail displays.
- A11.2 Construct store displays by using various fixtures (e.g., mannequins, shadow boxes, wall and tabletop displays, and props) to convey specific messages (e.g., a store's image, a specific manufacturer's label, a color or fabric story, or a specific event).

A11.3 Understand the theory and practice of merchandise placement on a sales floor.

A11.4 Understand methods of visual merchandising for consumer products on the Internet.

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*A12.0 Students understand the current laws and worksite policies regarding inventory control and loss prevention:*

A12.1 Know the procedures involved in receiving, inspecting, and marking merchandise and distributing it to the selling floor.

A12.2 Know the role of interstore transfers in the general distribution of goods.

A12.3 Know the current laws that affect inventories.

A12.4 Know common inventory loss points and strategies for loss prevention.

A12.5 Analyze how loss prevention affects all profits.

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## B. Interior Design, Furnishings, and Maintenance Pathway

The Interior Design, Furnishings, and Maintenance Pathway is designed to prepare students for careers in this rapidly growing field. Students pursuing this career pathway study the principles and elements of the design, selection, and care of textiles and furnishings; the principles of space planning and interior systems; and the principles of computer-assisted design.

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*B1.0 Students understand important aspects of the industry and the role of the industry in local, state, national, and global economies:*

- B1.1 Know how the various segments of the industry contribute to local, state, national, and global economies.
  - B1.2 Know how such resources as periodicals, mass media, and the Internet are used in the industry.
  - B1.3 Recognize major legislative, economic, and social trends that have an impact on the industry.
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*B2.0 Students understand key operational procedures and laws in the industry:*

- B2.1 Understand how various factors (e.g., operational costs, markup, and mark-down) affect profit.
  - B2.2 Understand various types of liability, insurance policies, service agreements, and contracts and the need to comply with codes.
  - B2.3 Understand the purpose of the California State Board of Equalization and the function of tax forms and resale numbers.
  - B2.4 Plan and organize work schedules, with a timeline showing the stages from consultation through installation.
  - B2.5 Understand how designers determine their fees for services and materials.
  - B2.6 Prepare and maintain appropriate records, correspondence, and forms as required.
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*B3.0 Students understand and apply the elements and principles of design to various aspects of the interior design industry:*

- B3.1 Understand the elements and principles of design and their interrelationships.
  - B3.2 Understand the concept of universal design and relate it to the industry.
  - B3.3 Use the elements and principles of design when designing, marketing, and merchandising products.
  - B3.4 Understand the fundamentals of color theory and color forecasting.
  - B3.5 Use various types of technology in the design process.
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*B4.0 Students understand the main principles of sales and marketing in the interior design and furnishings industry:*

- B4.1 Know factors that contribute to quality customer relations, service, and sales.

- B4.2 Evaluate the impact of cultural factors on customers' needs, desires, and satisfaction.
- B4.3 Analyze sales and marketing techniques for their effectiveness.
- B4.4 Know strategies for helping customers select merchandise, and recommend related services appropriate to their needs.
- B4.5 Know how technology can be used to provide customer service and follow-up.
- B4.6 Know basic policies and procedures for sales, exchanges, and returns.

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*B5.0 Students understand and apply important aspects of space planning and know the characteristics of interior systems:*

- B5.1 Understand the measurement of interior spaces, including unusually shaped and rounded areas, and how to determine square footage.
- B5.2 Interpret blueprints for accuracy and traffic flow and evaluate space for furniture placement and activities.
- B5.3 Understand the function and symbols unique to interior systems, such as plumbing, lighting, electrical, ventilation, and heating/air conditioning.
- B5.4 Use the correct scale and architectural symbols to draw interior spaces, including placement of doors, windows, and outlets.
- B5.5 Analyze space needs on the basis of clients' specifications.

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*B6.0 Students understand the selection of window, wall, and floor treatments:*

- B6.1 Estimate costs of materials, fabrication, and installation.
- B6.2 Know a variety of window types, styles, construction, materials, hardware, and their functions and the need to comply with industry codes.
- B6.3 Describe the function, appearance, and installation of primary types of window treatments and floor and wall coverings.
- B6.4 Know the procedures for tracking and following through on work orders for window, wall, and floor treatments.
- B6.5 Know the process for installing window, wall, and floor treatments, including measuring, estimating costs, and tracking and following through on work orders.

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*B7.0 Students understand the selection of furniture, upholstery and slipcovers, and accessories for residential and commercial interiors:*

- B7.1 Understand procedures, processes, and labels used for the production of furniture, coverings, and accessories that meet industry standards and codes.
- B7.2 Know the primary types of woods, fillers, materials, finishes, and frames.
- B7.3 Know the primary types of fabrics, trims, and finishes for various furniture, coverings, and accessories.
- B7.4 Understand how ergonomic and anthropometric concepts assist clients in the selection and adaptation of furnishings.
- B7.5 Select appropriate furnishings by evaluating the quality, source, function, and vendors' attributes.



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*B8.0 Students understand and apply important aspects of residential and commercial interior design:*

- B8.1 Understand space needs based on clients' specifications.
- B8.2 Understand the concept of universal design and describe ways in which to meet clients' needs.
- B8.3 Understand the importance and process of outlining schedules for completing work and installing appliances and cabinetry.

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*B9.0 Students understand the fabrication of treatments for windows, walls, floors, and furnishings:*

- B9.1 Know the appropriate tools and supplies needed to produce window, wall, and floor treatments and coverings.
- B9.2 Understand the steps, procedures, and processes necessary for the production of window coverings, furnishings, and accessories.
- B9.3 Use appropriate tools (e.g., power and specialty sewing machines and other equipment) for fabrication purposes.
- B9.4 Use construction skills and techniques that meet industry standards.
- B9.5 Interpret and complete orders by using accepted production methods.

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*B10.0 Students understand the history and events that have influenced the design of furnishings:*

- B10.1 Know basic furniture styles from historical periods.
- B10.2 Know the characteristics of furnishings that typify various periods throughout history.
- B10.3 Analyze recurring historical designs in today's furnishings.
- B10.4 Understand how furnishings from a particular period in history were influenced by political, social, economic, and aesthetic conditions.
- B10.5 Understand how prosperity, mass production, and technology are related to the economics of the furnishings segment of the industry.

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*B11.0 Students understand the main design concepts that pertain to commercial and residential interior design:*

- B11.1 Understand the importance of clients' needs to the development of a design concept.
- B11.2 Understand the relationship of clients' needs to the development of a design concept.
- B11.3 Know the compliance requirements of the Americans with Disabilities Act (e.g., barrier-free elements and safety features) in the planning of residential and commercial designs.
- B11.4 Know environmentally friendly and sustainable design concepts that reflect federal guidelines and voluntary standards, such as Leadership in Energy and Environmental Design.

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*B12.0 Students understand the effective procedures used to clean and maintain residential and commercial environments:*

- B12.1 Know the various jobs and tasks required to clean and maintain residential and commercial buildings.
- B12.2 Know the appropriate cleaning supplies, equipment, and procedures needed to perform a variety of cleaning tasks.
- B12.3 Know procedures that prevent damage when cleaning and maintaining residential and commercial areas.
- B12.4 Know safety procedures and how to use material safety data sheets for handling, using, storing, and disposing of cleaning supplies, equipment, and hazardous waste materials.
- B12.5 Understand the types of services provided by a property-maintenance business.
- B12.6 Evaluate service contracts for a variety of cleaning and maintenance services.

The background of the slide features a large, light gray watermark of the Seal of the Board of Education of the State of Alaska. The seal is circular and contains the text "BOARD OF EDUCATION" at the top and "STATE OF ALASKA" at the bottom, separated by a rope-like border. The central figure is a woman in a classical-style dress and helmet, holding a spear. Below her are various symbols: a bear, a plow, a ship, and a landscape with mountains and water.

## **Finance and Business Industry Sector**

### *Career Pathways*

- ◆ Accounting Services
- ◆ Banking and Related Services
- ◆ Business Financial Management



# Finance and Business Industry Sector

Persons trained in such fields as accounting, banking, and finance will find that their skills are highly marketable. Students master basic accounting principles and procedures before proceeding to the career path specializations. The specializations emphasize concepts of accounting and finance, including computer applications, taxes, investments, and asset management. Because almost every business organization has an accounting component, students with knowledge of accounting will find that opportunities exist in many other career paths in addition to those in finance and business.

## FOUNDATION STANDARDS

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### 1.0 Academics

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

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, and history–social science content standards adopted by the State Board of Education.)*

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#### 1.1 Mathematics

Specific applications of Number Sense standards (grade seven):

- (1.1) Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.
- (1.2) Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
- (1.3) Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
- (1.4) Differentiate between rational and irrational numbers.
- (1.5) Know that every rational number is either a terminating or a repeating decimal and be able to convert terminating decimals into reduced fractions.
- (1.6) Calculate the percentage of increases and decreases of a quantity.

- (1.7) Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

Specific applications of Statistics, Data Analysis, and Probability standards (grade seven):

- (1.1) Know various forms of display for data sets, including a stem-and-leaf plot or box-and-whisker plot; use the forms to display a single set of data or to compare two sets of data.
- (1.2) Represent two numerical variables on a scatterplot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level).
- (1.3) Understand the meaning of, and be able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.

Specific applications of Mathematical Reasoning standards (grade seven):

- (1.1) Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
- (2.1) Use estimation to verify the reasonableness of calculated results.
- (2.2) Apply strategies and results from simpler problems to more complex problems.
- (2.3) Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- (2.4) Make and test conjectures by using both inductive and deductive reasoning.
- (2.5) Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- (2.6) Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- (2.7) Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- (2.8) Make precise calculations and check the validity of the results from the context of the problem.
- (3.1) Evaluate the reasonableness of the solution in the context of the original situation.
- (3.2) Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- (3.3) Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.

Specific applications of Algebra I standards (grades eight through twelve):

- (1.1) Students use properties of numbers to demonstrate whether assertions are true or false.
- (5.0) Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.

- (13.0) Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.
  - (15.0) Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.
  - (24.1) Students explain the difference between inductive and deductive reasoning and identify and provide examples of each.
  - (24.2) Students identify the hypothesis and conclusion in logical deduction.
  - (24.3) Students use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.
  - (25.1) Students use properties of numbers to construct simple, valid arguments (direct and indirect) for, or formulate counterexamples to, claimed assertions.
  - (25.2) Students judge the validity of an argument according to whether the properties of the real number system and the order of operations have been applied correctly at each step.
  - (25.3) Given a specific algebraic statement involving linear, quadratic, or absolute value expressions or equations or inequalities, students determine whether the statement is true sometimes, always, or never.
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### 1.2 Science

Specific applications of Investigation and Experimentation standards (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.
  - (1.d) Formulate explanations by using logic and evidence.
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### 1.3 History–Social Science

Specific applications of World History, Culture, and Geography: The Modern World standards (grade ten):

- (10.3) Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.
  - (10.3.1) Analyze why England was the first country to industrialize.
  - (10.3.2) Examine how scientific and technological changes and new forms of energy brought about massive social, economic, and cultural change (e.g., the inventions and discoveries of James Watt, Eli Whitney, Henry Bessemer, Louis Pasteur, Thomas Edison).
  - (10.3.3) Describe the growth of population, rural to urban migration, and growth of cities associated with the Industrial Revolution.
  - (10.3.4) Trace the evolution of work and labor, including the demise of the slave trade and the effects of immigration, mining and manufacturing, division of labor, and the union movement.

- (10.3.5) Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.
- (10.3.6) Analyze the emergence of capitalism as a dominant economic pattern and the responses to it, including Utopianism, Social Democracy, Socialism, and Communism.

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (11.11) Students analyze the major social problems and domestic policy issues in contemporary American society.
  - (11.11.1) Discuss the reasons for the nation's changing immigration policy, with emphasis on how the Immigration Act of 1965 and successor acts have transformed American society.
  - (11.11.2) Discuss the significant domestic policy speeches of Truman, Eisenhower, Kennedy, Johnson, Nixon, Carter, Reagan, Bush, and Clinton (e.g., with regard to education, civil rights, economic policy, environmental policy).
  - (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.
  - (11.11.4) Explain the constitutional crisis originating from the Watergate scandal.
  - (11.11.5) Trace the impact of, need for, and controversies associated with environmental conservation, expansion of the national park system, and the development of environmental protection laws, with particular attention to the interaction between environmental protection advocates and property rights advocates.
  - (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.
  - (11.11.7) Explain how the federal, state, and local governments have responded to demographic and social changes such as population shifts to the suburbs, racial concentrations in the cities, Frostbelt-to-Sunbelt migration, international migration, decline of family farms, increases in out-of-wedlock births, and drug abuse.

Specific applications of Principles of Economics standards (grade twelve):

- (12.1) Students understand common economic terms and concepts and economic reasoning.
  - (12.1.1) Examine the causal relationship between scarcity and the need for choices.
  - (12.1.2) Explain opportunity cost and marginal benefit and marginal cost.
  - (12.1.3) Identify the difference between monetary and nonmonetary incentives and how changes in incentives cause changes in behavior.
  - (12.1.4) Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.
  - (12.1.5) Analyze the role of a market economy in establishing and preserving political and personal liberty (e.g., through the works of Adam Smith).
- (12.2) Students analyze the elements of America's market economy in a global setting.

- (12.2.1) Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.
- (12.2.2) Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.
- (12.2.3) Explain the roles of property rights, competition, and profit in a market economy.
- (12.2.4) Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.
- (12.2.5) Understand the process by which competition among buyers and sellers determines a market price.
- (12.2.6) Describe the effect of price controls on buyers and sellers.
- (12.2.7) Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.
- (12.2.8) Explain the role of profit as the incentive to entrepreneurs in a market economy.
- (12.2.9) Describe the functions of the financial markets.
- (12.2.10) Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.
- (12.3) Students analyze the influence of the federal government on the American economy.
- (12.3.1) Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.
- (12.3.2) Identify the factors that may cause the costs of government actions to outweigh the benefits.
- (12.3.3) Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.
- (12.3.4) Understand the aims and tools of monetary policy and their influence on economic activity (e.g., the Federal Reserve).
- (12.4) Students analyze the elements of the U.S. labor market in a global setting.
- (12.4.1) 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.
- (12.4.2) Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.
- (12.4.3) Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.



- (12.4.4) Explain the effects of international mobility of capital and labor on the U.S. economy.
- (12.5) Students analyze the aggregate economic behavior of the U.S. economy.
  - (12.5.1) Distinguish between nominal and real data.
  - (12.5.2) Define, calculate, and explain the significance of an unemployment rate, the number of new jobs created monthly, an inflation or deflation rate, and a rate of economic growth.
  - (12.5.3) Distinguish between short-term and long-term interest rates and explain their relative significance.
- (12.6) Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States's borders.
  - (12.6.1) Identify the gains in consumption and production efficiency from trade, with emphasis on the main products and changing geographic patterns of twentieth-century trade among countries in the Western Hemisphere.
  - (12.6.2) Compare the reasons for and the effects of trade restrictions during the Great Depression compared with present-day arguments among labor, business, and political leaders over the effects of free trade on the economic and social interests of various groups of Americans.
  - (12.6.3) Understand the changing role of international political borders and territorial sovereignty in a global economy.
  - (12.6.4) Explain foreign exchange, the manner in which exchange rates are determined, and the effects of the dollar's gaining (or losing) value relative to other currencies.

## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English–language arts content standards adopted by the State Board of Education.)*

### 2.1 Reading

Specific applications of Reading Comprehension standards (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.
- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (2.3) Generate relevant questions about readings on issues that can be researched.
- (2.4) Synthesize the content from several sources or works by a single author dealing with a single issue; paraphrase the ideas and connect them to other sources and related topics to demonstrate comprehension.

- (2.5) Extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration.
- (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).
- (2.7) Critique the logic of functional documents by examining the sequence of information and procedures in anticipation of possible reader misunderstandings.

Specific applications of Reading Comprehension standards (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.

## 2.2 Writing

Specific applications of Writing Strategies and Applications standards (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.
- (1.4) Develop the main ideas within the body of the composition through supporting evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions).
- (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).
- (1.6) Integrate quotations and citations into a written text while maintaining the flow of ideas.
- (1.7) Use appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals (e.g., *Modern Language Association Handbook*, *The Chicago Manual of Style*).
- (1.8) Design and publish documents by using advanced publishing software and graphic programs.
- (1.9) Revise writing to improve the logic and coherence of the organization and controlling perspective, the precision of word choice, and the tone by taking into consideration the audience, purpose, and formality of the context.
- (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.
- (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.
- (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.
- (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.

Specific applications of Writing Strategies and Applications standards (grades eleven and twelve):

- (1.1) Demonstrate an understanding of the elements of discourse (e.g., purpose, speaker, audience, form) when completing narrative, expository, persuasive, or descriptive writing assignments.
- (1.3) Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.
- (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).
- (1.7) Use systematic strategies to organize and record information (e.g., anecdotal scripting, annotated bibliographies).
- (1.8) Integrate databases, graphics, and spreadsheets into word-processed documents.

- (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.
- (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.

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### 2.3 *Written and Oral English Language Conventions*

Specific applications of English Language Conventions standards (grades nine and ten):

- (1.1) Identify and correctly use clauses (e.g., main and subordinate), phrases (e.g., gerund, infinitive, and participial), and mechanics of punctuation (e.g., semicolons, colons, ellipses, hyphens).
- (1.2) Understand sentence construction (e.g., parallel structure, subordination, proper placement of modifiers) and proper English usage (e.g., consistency of verb tenses).
- (1.3) Demonstrate an understanding of proper English usage and control of grammar, paragraph and sentence structure, diction, and syntax.
- (1.4) Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
- (1.5) Reflect appropriate manuscript requirements, including title page presentation, pagination, spacing and margins, and integration of source and support material (e.g., in-text citation, use of direct quotations, paraphrasing) with appropriate citations.

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### 2.4 *Listening and Speaking*

Specific applications of Listening and Speaking Strategies and Applications standards (grades nine and ten):

- (1.1) Formulate judgments about the ideas under discussion and support those judgments with convincing evidence.
- (1.2) Compare and contrast the ways in which media genres (e.g., televised news, news magazines, documentaries, online information) cover the same event.

- (1.3) Choose logical patterns of organization (e.g., chronological, topical, cause and effect) to inform and to persuade, by soliciting agreement or action, or to unite audiences behind a common belief or cause.
- (1.7) Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.
- (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.
- (2.4) Deliver oral responses to literature:
  - a. Advance a judgment demonstrating a comprehensive grasp of the significant ideas of works or passages (i.e., make and support warranted assertions about the text).
  - b. Support important ideas and viewpoints through accurate and detailed references to the text or to other works.
  - c. Demonstrate awareness of the author's use of stylistic devices and an appreciation of the effects created.
  - d. Identify and assess the impact of perceived ambiguities, nuances, and complexities within the text.
- (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.
- (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.

Specific applications of Speaking Applications standards (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.
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- 2.5 Students understand written business communication modes, such as memos, e-mail messages, and one-page executive summaries.
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### 3.0 Career Planning and Management

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

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, 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.
  - 3.7 Explore career opportunities in business through such programs as virtual enterprise, work experience, and internship.
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### 4.0 Technology

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

- 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.
- 4.4 Understand effective technologies for Web site development and Internet usage.

- 4.5 Know procedures for maintaining secure information, preventing loss, and reducing risk.

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## 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:

- 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.
- 5.4 Understand how financial systems and tools are used to solve business problems.

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## 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:

- 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.
- 6.3 Understand the environmental and ergonomic risks associated with the use of business equipment and the financial impact of an unsafe work environment.

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## 7.0 Responsibility and Flexibility

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

- 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.

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## 8.0 Ethics and Legal Responsibilities

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

- 8.1 Know 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.
- 8.4 Understand major local, state, and federal laws and regulations that affect business and the procedural requirements necessary for compliance.
- 8.5 Know how to design systems and applications to allow access to all users, including those with cultural, physical, and cognitive differences.

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## 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:

- 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, such as DECA (An Association of Marketing Students) and Future Business Leaders of America, 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.

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## 10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Finance and Business sector:

- 10.1 Know cash management techniques, including bank reconciliation and cash controls.
- 10.2 Understand the role of managerial accounting and the use of planning and control principles to evaluate the performance of an organization.
- 10.3 Know the agencies that affect accounting procedures and discuss regulations and compliance issues that influence business decisions.
- 10.4 Examine and use technological services to achieve objectives and make decisions in accounting and finance.

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## 11.0 Demonstration and Application

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



## PATHWAY STANDARD

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### A. Accounting Services Pathway

Students in the Accounting Services Pathway learn how to design, install, maintain, and use general accounting systems and prepare, analyze, and verify financial reports and related economic information to help make important financial decisions for an organization. Accounting is an essential aspect of every business institution and organization. Analysis of business transactions, preparation of financial statements, and knowledge of accounting systems are critical to all business operations. Employment of accountants and auditors is expected to grow as fast as the average growth rate for all occupations in the future.

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*A1.0 Students understand the basic principles and procedures of the accounting cycle:*

- A1.1 Understand the accounting cycle for service businesses and merchandise businesses.
  - A1.2 Examine, analyze, and categorize financial transactions.
  - A1.3 Complete the accounting cycles for a service business and a merchandise business.
  - A1.4 Prepare, analyze, and interpret financial statements for various business entities.
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*A2.0 Students understand and apply accounting principles and concepts:*

- A2.1 Understand how to identify current and long-term assets and liabilities.
  - A2.2 Apply appropriate concepts and techniques to account for equity investments and withdrawals for sole proprietorships, partnerships, and corporations.
  - A2.3 Understand the processes involved in revenue recognition and in matching of income and expenses.
  - A2.4 Know the procedures for the acquisition, disposition, and depreciation of fixed assets.
  - A2.5 Use basic concepts of financial analysis to interpret financial statements.
  - A2.6 Know payroll procedures.
- 

*A3.0 Students understand governing agencies and the typical development and structure of various business environments:*

- A3.1 Understand the major types of business organizations and the risks and benefits of each.
- A3.2 Understand the influence of key agencies, regulations, and issues on accounting procedures and business decisions.
- A3.3 Know the basic international terminology and theories used in accounting and finance.

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A4.0 *Students understand how the basic principles of internal control systems relate to the accounting cycle:*

A4.1 Understand a variety of internal control measures.

A4.2 Know cash management techniques.

A4.3 Understand the role of managerial accounting.

A4.4 Understand how planning and control principles are used to evaluate the performance of an organization.

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## **B. Banking and Related Services Pathway**

Students understand basic concepts pertaining to a variety of banking and related financial services. Employees working in occupations in the Banking and Related Services Pathway provide loans, credit, and payment services to businesses and to individuals. Knowledge of money and banking, lending fundamentals, and banking regulations is necessary for handling financial transactions. Employment in the banking industry is expected to increase because of the expansion of credit unions, small regional banks, and savings institutions.

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*B1.0 Students understand the concepts involved in providing customer service in banking and related services:*

- B1.1 Employ technical skills to perform teller functions, data processing functions, new-account functions, and lending functions.
- B1.2 Understand the nature and demands of professionalism in working relationships with customers and employees.
- B1.3 Demonstrate basic selling techniques to assist customers in making an informed buying decision.
- B1.4 Use accounting knowledge to perform bookkeeping functions.

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*B2.0 Students understand the main operations and management techniques of banking and related services:*

- B2.1 Know basic banking concepts and terms.
- B2.2 Understand techniques for managing personnel to maximize operations.
- B2.3 Understand the role of organizational, time-management, and multitasking skills.

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*B3.0 Students understand the regulatory compliance of banking and related services:*

- B3.1 Understand the role of the Federal Reserve System in the banking industry.
- B3.2 Know the procedures necessary to adhere to banking regulations.
- B3.3 Know internal audit procedures to ensure compliance.
- B3.4 Understand the review process for bank records in preparation for examination by an external entity.

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## C. Business Financial Management Pathway

Students in the Business Financial Management Pathway learn to provide investment analysis and guidance to help businesses and individuals with their investment decisions. Students learn that exploring, applying, and monitoring investment opportunities are necessary to take advantage of financial opportunities throughout one's life. Employment in the securities and commodities sector of the industry will continue to expand because of the increasing levels of investment in the global marketplace and the growing need for investment advice.

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*C1.0 Students create and use budgets to guide financial decision making:*

- C1.1 Create a budget to calculate long-term projections.
  - C1.2 Analyze past and current budgets to determine financial business needs.
  - C1.3 Understand how the financial needs of a business change in a dynamic and competitive marketplace.
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*C2.0 Students know how to analyze and interpret financial data:*

- C2.1 Use basic concepts of financial analysis to interpret financial statements.
  - C2.2 Analyze and interpret financial statements to compare risk and return.
  - C2.3 Know the differences between financial statements prepared for internal use and those prepared for external use.
  - C2.4 Understand the primary ways in which various types of domestic and international financial markets influence interest rates, trade deficits, and unemployment.
  - C2.5 Determine creditworthiness on the basis of appropriate criteria and identify alternative sources of credit.
  - C2.6 Analyze investment and finance options available to prepare a cost-benefit analysis.
- 

*C3.0 Students understand the impact of federal, state, and local regulations on financial management decisions:*

- C3.1 Understand the effects of tax structures on business decision making.
  - C3.2 Know the legal rights and responsibilities of various types of businesses.
  - C3.3 Analyze the ways in which current laws and regulations enforce appropriate financial practices.
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*C4.0 Students understand the role of insurance products and services in successful business management:*

- C4.1 Know the appropriate uses of basic types of insurance policies.
- C4.2 Understand the ways in which insurance reduces risk.



# Health Science and Medical Technology Industry Sector

## *Career Pathways*

- ◆ Biotechnology Research and Development
- ◆ Diagnostic Services
- ◆ Health Informatics
- ◆ Support Services
- ◆ Therapeutic Services



# Health Science and Medical Technology Industry Sector

The standards in the Health Science and Medical Technology sector represent the academic and technical skills and knowledge students need to pursue a full range of career opportunities in this sector, from entry level to management, including technical and professional career specialties. The standards tell what workers need to know and be able to do to contribute to the delivery of safe and effective health care.

The career pathways are grouped into functions that have a common purpose and require similar attributes. The career pathways are Biotechnology Research and Development, Diagnostic Services, Health Informatics, Support Services, and Therapeutic Services. Standards for each career path build on and continue the foundation standards with more complexity, rigor, and career specificity.

## FOUNDATION STANDARDS

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### 1.0 Academics

Students understand the academic content required for entry into postsecondary education and employment in the Health Science and Medical Technology sector.

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, and history–social science content standards adopted by the State Board of Education.)*

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#### 1.1 Mathematics

Specific applications of Measurement and Geometry standards (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).
- (1.2) Construct and read drawings and models made to scale.
- (1.3) Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.

Specific applications of Mathematical Reasoning standards (grade seven):

- (1.1) Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
- (1.2) Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.
- (1.3) Determine when and how to break a problem into simpler parts.

## 1.2 Science

Specific applications of Focus on Life Sciences standards (grade seven):

- (1.a) Students know cells function similarly in all living organisms.
- (5.a) Students know plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism.
- (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.
- (5.c) Students know how bones and muscles work together to provide a structural framework for movement.
- (5.d) Students know how the reproductive organs of the human female and male generate eggs and sperm and how sexual activity may lead to fertilization and pregnancy.
- (5.e) Students know the function of the umbilicus and placenta during pregnancy.
- (5.g) Students know how to relate the structures of the eye and ear to their functions.

Specific applications of Biology/Life Sciences standards (grades nine through twelve):

- (1.a) Students know cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings.
- (1.b) Students know enzymes are proteins that catalyze biochemical reactions without altering the reaction equilibrium and the activities of enzymes depend on the temperature, ionic conditions, and the pH of the surroundings.
- (1.c) Students know how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure.
- (1.d) Students know the central dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm.
- (1.e) Students know the role of the endoplasmic reticulum and Golgi apparatus in the secretion of proteins.
- (1.f) Students know usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.
- (1.g) Students know the role of the mitochondria in making stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide.
- (1.h) Students know most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from a small collection of simple precursors.

- (1.i) Students know how chemiosmotic gradients in the mitochondria and chloroplast store energy for ATP production.
- (1.j) Students know how eukaryotic cells are given shape and internal organization by a cytoskeleton or cell wall or both.
- (2.a) Students know meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.
- (2.b) Students know only certain cells in a multicellular organism undergo meiosis.
- (2.c) Students know how random chromosome segregation explains the probability that a particular allele will be in a gamete.
- (2.d) Students know new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).
- (2.e) Students know why approximately half of an individual's DNA sequence comes from each parent.
- (2.f) Students know the role of chromosomes in determining an individual's sex.
- (2.g) Students know how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents.
- (3.a) Students know how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive).
- (3.b) Students know the genetic basis for Mendel's laws of segregation and independent assortment.
- (3.c) Students know how to predict the probable mode of inheritance from a pedigree diagram showing phenotypes.
- (3.d) Students know how to use data on frequency of recombination at meiosis to estimate genetic distances between loci and to interpret genetic maps of chromosomes.
- (4.a) Students know the general pathway by which ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA.
- (4.b) Students know how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA.
- (4.c) Students know how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.
- (4.d) Students know specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.
- (4.e) Students know proteins can differ from one another in the number and sequence of amino acids.
- (4.f) Students know why proteins having different amino acid sequences typically have different shapes and chemical properties.
- (5.d) Students know how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation, and transformation) is used to construct recombinant DNA molecules.



- (5.e) Students know how exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products.
- (9.a) Students know how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.
- (9.b) Students know how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.
- (9.c) Students know how feedback loops in the nervous and endocrine systems regulate conditions in the body.
- (9.d) Students know the functions of the nervous system and the role of neurons in transmitting electrochemical impulses.
- (9.e) Students know the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response.
- (9.f) Students know the individual functions and sites of secretion of digestive enzymes (amylases, proteases, nucleases, lipases), stomach acid, and bile salts.
- (9.g) Students know the homeostatic role of the kidneys in the removal of nitrogenous wastes and the role of the liver in blood detoxification and glucose balance.
- (9.h) Students know the cellular and molecular basis of muscle contraction, including the roles of actin, myosin,  $\text{Ca}^{+2}$ , and ATP.
- (9.i) Students know how hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.
- (10.a) Students know the role of the skin in providing nonspecific defenses against infection.
- (10.b) Students know the role of antibodies in the body's response to infection.
- (10.c) Students know how vaccination protects an individual from infectious diseases.
- (10.d) Students know there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.
- (10.e) Students know why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.
- (10.f) Students know the roles of phagocytes, B-lymphocytes, and T-lymphocytes in the immune system.

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### 1.3 *History–Social Science*

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (11.8) Students analyze the economic boom and social transformation of post-World War II America.
- (11.8.1) Trace the growth of service sector, white collar, and professional sector jobs in business and government.

- (11.8.7) Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural technology.
- (11.8.8) Discuss forms of popular culture, with emphasis on their origins and geographic diffusion (e.g., jazz and other forms of popular music, professional sports, architectural and artistic styles).
- (11.11) Students analyze the major social problems and domestic policy issues in contemporary American society.
  - (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.
  - (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.
  - (11.11.7) Explain how the federal, state, and local governments have responded to demographic and social changes such as population shifts to the suburbs, racial concentrations in the cities, Frostbelt-to-Sunbelt migration, international migration, decline of family farms, increases in out-of-wedlock births, and drug abuse.

## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English–language arts content standards adopted by the State Board of Education.)*

### 2.1 Reading

Specific applications of Reading Comprehension standards (grades nine and ten):

- (1.1) Identify and use the literal and figurative meanings of words and understand word derivations.
- (1.2) Distinguish between the denotative and connotative meanings of words and interpret the connotative power of words.
- (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).
- (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.
- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (2.3) Generate relevant questions about readings on issues that can be researched.
- (2.7) Critique the logic of functional documents by examining the sequence of information and procedures in anticipation of possible reader misunderstandings.

Specific applications of Reading standards (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.
- (2.3) Verify and clarify facts presented in other types of expository texts by using a variety of consumer, workplace, and public documents.

## 2.2 Writing

Specific applications of Writing Strategies and Applications standards (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).
- (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.
- (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.
- (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.

Specific applications of Writing Strategies and Applications standards (grades eleven and twelve):

- (1.5) Use language in natural, fresh, and vivid ways to establish a specific tone.
- (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).
- (1.7) Use systematic strategies to organize and record information (e.g., anecdotal scripting, annotated bibliographies).
- (1.8) Integrate databases, graphics, and spreadsheets into word-processed documents.
- (2.3) Write reflective compositions:
  - a. Explore the significance of personal experiences, events, conditions, or concerns by using rhetorical strategies (e.g., narration, description, exposition, persuasion).
  - b. Draw comparisons between specific incidents and broader themes that illustrate the writer's important beliefs or generalizations about life.
  - c. Maintain a balance in describing individual incidents and relate those incidents to more general and abstract ideas.
- (2.4) Write historical investigation reports:
  - a. Use exposition, narration, description, argumentation, exposition, or some combination of rhetorical strategies to support the main proposition.
  - b. Analyze several historical records of a single event, examining critical relationships between elements of the research topic.
  - c. Explain the perceived reason or reasons for the similarities and differences in historical records with information derived from primary and secondary sources to support or enhance the presentation.
  - d. Include information from all relevant perspectives and take into consideration the validity and reliability of sources.
  - e. Include a formal bibliography.
- (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.
- (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.

### 2.3 *Written and Oral English Language Conventions*

Specific applications of English Language Conventions standards (grades nine and ten):

- (1.1) Identify and correctly use clauses (e.g., main and subordinate), phrases (e.g., gerund, infinitive, and participial), and mechanics of punctuation (e.g., semicolons, colons, ellipses, hyphens).
- (1.2) Understand sentence construction (e.g., parallel structure, subordination, proper placement of modifiers) and proper English usage (e.g., consistency of verb tenses).
- (1.3) Demonstrate an understanding of proper English usage and control of grammar, paragraph and sentence structure, diction, and syntax.
- (1.4) Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
- (1.5) Reflect appropriate manuscript requirements, including title page presentation, pagination, spacing and margins, and integration of source and support material (e.g., in-text citation, use of direct quotations, paraphrasing) with appropriate citations.

Specific applications of English Language Conventions standards (grades eleven and twelve):

- (1.1) Demonstrate control of grammar, diction, and paragraph and sentence structure and an understanding of English usage.
- (1.2) Produce legible work that shows accurate spelling and correct punctuation and capitalization.

### 2.4 *Listening and Speaking*

Specific applications of Speaking Applications standards (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.
- (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.
- (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.
- (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.

Specific applications of Speaking Applications standards (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.

- 
- 2.5 Know and understand medical terminology to interpret, transcribe, and communicate information and observations necessary for workers in the health care industry.
  - 2.6 Know and understand the use of organizational channels and networks as a necessary means of communications.
  - 2.7 Understand the importance of verbal and nonverbal communication in the health care industry.

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### 3.0 Career Planning and Management

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

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, 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.

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### 4.0 Technology

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

- 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.
- 4.4 Understand the impact of enhanced technology, bioethics, epidemiology, and socioeconomics on the health care delivery system.
- 4.5 Know how to interpret technical materials and medical instrumentation used for health care practices and policies.

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### 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:

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

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## 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:

- 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 for health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.3 Understand the importance and use of standard precautions and infection control, as appropriate.
- 6.4 Understand the principles of body mechanics and ergonomics in providing patient care.
- 6.5 Understand the rules and regulations of the Occupational Safety and Health Administration and the Centers for Disease Control and Prevention.

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## 7.0 Responsibility and Flexibility

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

- 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.
- 7.5 Know how to interact appropriately and respectfully in various employment situations that involve persons from diverse ethnic, generational, cultural, religious, and economic groups and persons of different genders and sexual orientation.
- 7.6 Know and appreciate cultural differences and provide culturally competent care to patients and clients.
- 7.7 Understand and demonstrate methods for promoting health and wellness.

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## 8.0 Ethics and Legal Responsibilities

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

- 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.
- 8.4 Understand the ways in which ethical considerations affect emerging technologies and their impact on society.



- 8.5 Understand and maintain the Patients' Bill of Rights, patients' and clients' confidentiality, and the Health Insurance Portability and Accountability Act of 1996.

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## 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:

- 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, such as the Health Occupations Students of America, 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.

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## 10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Health Science and Medical Technology sector:

- 10.1 Understand the process for determining mission statements, goals, objectives, and strategic plans for a health care organization and understand the process for using appropriate policies, procedures, and processes as defined by the scope of practice of a specific health care organization.
- 10.2 Understand how the health care delivery systems models can be affected by cost, managed care, technology, an aging population, access to care, alternative therapies, and lifestyle and behavior changes.
- 10.3 Understand the purpose and function of a systems-theory approach, both in the health care organization and in the treatment of patients and clients, as a process for viewing a system as a whole before examining its parts.
- 10.4 Understand the interconnected components of a health care system.
- 10.5 Understand the nature of the interdependency of health care professionals within a given health care delivery system.
- 10.6 Know cardiopulmonary resuscitation and first-aid practices.
- 10.7 Understand the processes used to evaluate alternative health practices.

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## 11.0 Demonstration and Application

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

## PATHWAY STANDARDS

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### A. Biotechnology Research and Development Pathway

The standards for the Biotechnology Research and Development Pathway apply to occupations and functions in biotechnology research and development that apply primarily to human health. The standards specify the knowledge and skills common to occupations in this pathway.

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*A1.0 Students know the role of the biotechnology industry and biotechnology product development in curing diseases:*

- A1.1 Understand the role of the biotechnology industry and its impact on society.
  - A1.2 Understand the role of biotechnology product development in curing genetic, environmental, and behavioral diseases.
  - A1.3 Understand the legal and ethical issues regarding the use of biotechnology to cure diseases.
  - A1.4 Understand the relationship between biochemistry and biotechnology product development.
- 

*A2.0 Students know the fundamentals of mathematical and scientific concepts related to biotechnology:*

- A2.1 Understand basic mathematical concepts related to the field, such as the calculation of percentages and ratios and the difference between standard deviation and various measures of central tendency.
  - A2.2 Understand the basic structure of a chromosome and the difference between a dominant homozygous trait and a heterozygous trait.
  - A2.3 Know the basic structures and functions of cells and how this knowledge is used in biotechnology.
  - A2.4 Understand the central theory of molecular biology.
- 

*A3.0 Students understand the role of recombinant DNA and genetic engineering, bioprocessing, monoclonal antibody production, separation and purification of biotechnology products, nanotechnology, bioinformatics, genomics, proteomics, and transcriptomics in biotechnical product development:*

- A3.1 Understand recombinant DNA, genetic engineering, monoclonal antibody production, separation and purification of biotechnology products, and bioprocessing.
- A3.2 Understand how the fields of nanotechnology, bioinformatics, genomics, proteomics, and transcriptomics influence new and emerging career opportunities.

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*A4.0 Students understand the principles of solution preparation, contamination control, measurement and calibration, and emergency laboratory response:*

- A4.1 Understand how molarity relates to solution preparation.
- A4.2 Know how to calculate the molarity of a given solution and how to measure the pH of that solution.
- A4.3 Know how to prepare a serial dilution of a microbial culture.
- A4.4 Understand the importance and requirements of using sterile techniques in a laboratory.
- A4.5 Understand the appropriate responses to a laboratory accident.

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*A5.0 Students understand biotechnology product design and development, laboratory procedures, product licensure, and the regulatory process for product development and clinical trials:*

- A5.1 Understand the process of developing biotechnology products in an industrial setting.
- A5.2 Understand the role of preclinical and clinical trials in biotechnology product development.
- A5.3 Know the role of quality assurance in clinical trials.

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*A6.0 Students understand the ethical, moral, legal, and cultural issues related to the use of biotechnology research and product development:*

- A6.1 Understand the relationship between morality and ethics in the development of biotechnology health care products.
- A6.2 Know the differences between personal, professional, and organizational ethics.
- A6.3 Understand the necessity for accurate documentation and recordkeeping in biotechnology research and product development.
- A6.4 Understand the need for ethical policies and procedures in institutions engaged in biotechnology research and product development.

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## B. Diagnostic Services Pathway

The standards for the Diagnostic Services Pathway apply to occupations or functions involved primarily in creating a picture of the health status of patients at a single point in time. The standards specify the knowledge and skills needed by professionals pursuing careers in this pathway.

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*B1.0 Students know how to use appropriate methods and technology in a multidisciplinary health care industry to communicate information:*

- B1.1 Know how to evaluate and report relevant information effectively to the appropriate personnel.
- B1.2 Use medical terminology appropriate to diagnostic services to interpret, transcribe, and communicate information and observations.

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*B2.0 Students know the process for assessing and reporting the health status of patients and clients:*

- B2.1 Understand the process for analyzing available information to assess the health status of patients and clients.
- B2.2 Know the process for evaluating and appraising the appropriateness of information.
- B2.3 Know how to evaluate patients' and clients' responses to treatment and procedures.
- B2.4 Use appropriate documentation to report information about patients and clients.

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*B3.0 Students know the principles of body mechanics as they apply to the positioning, transferring, and transporting of patients and clients:*

- B3.1 Know the process for assessing the health status of patients and clients.
- B3.2 Know the process for evaluating potential hazards to patients and clients.
- B3.3 Know how to evaluate equipment for possible hazards.
- B3.4 Use appropriate transport and transfer methods to accommodate the health status of patients and clients.
- B3.5 Use appropriate equipment for transportation and transfer, including the modification of equipment and techniques, to accommodate the health status of patients and clients.
- B3.6 Use proper body mechanics, ergonomics, safety equipment, and techniques to prevent personal injury to patients and clients.

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*B4.0 Students know how to explain procedures and goals to patients and clients and use various strategies to respond to questions and concerns:*

- 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.

- B4.2 Use active listening skills (e.g., reflection, restatement, and clarification techniques) to provide information to patients and clients and to address their concerns and questions in an appropriate and positive manner.

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*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:*

- B5.1 Understand scope of practice, evaluate requests for appropriateness, and coordinate interdisciplinary services.
- B5.2 Use appropriate protocol after assessing patients, clients, and resources.
- B5.3 Follow patient-verification protocols to ensure readiness and appropriateness of procedures.

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## C. Health Informatics Pathway

The standards for the Health Informatics Pathway apply to occupations or functions that document patient care. The standards specify the knowledge and skills needed by professionals pursuing careers in this pathway.

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*C1.0 Students know the process established by the facility for communicating confidential health and medical information accurately and within the legal and regulatory guidelines:*

- C1.1 Know the process for managing the timely transfer of information accurately and effectively to the appropriate parties.
  - C1.2 Know the legal and regulatory requirements for the transfer of information.
- 

*C2.0 Students understand the design and implementation of an effective health care information system, including resources, routes, and flow of information:*

- C2.1 Understand the information systems used by the organization, including how information is organized and integrated for timely, accurate dissemination.
  - C2.2 Understand the process for evaluating the effectiveness of information systems and determining improvement strategies.
  - C2.3 Know how to organize information within the parameters of the information systems.
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*C3.0 Students understand the content and diverse uses of health information and the use of legal and regulatory guidelines to maintain, store, and communicate accurate and appropriate information:*

- C3.1 Understand the process for determining, interpreting, and accurately documenting required information.
  - C3.2 Understand the documentation and storage systems in use.
  - C3.3 Know the process for preparing and disseminating information to various audiences by using established information systems that operate within legal and regulatory guidelines.
  - C3.4 Formulate and report information clearly and concisely.
  - C3.5 Know the process for assessing information systems and making recommendations for improvement.
- 

*C4.0 Students know the quantitative and qualitative requirements that apply to health information and know how to analyze the information for designated purposes:*

- C4.1 Know the process for assessing whether information is reported and disseminated within legal and regulatory bounds.
- C4.2 Know the process for assessing information required by patients, staff, and the community to determine the best course of action.

- C4.3 Know the process for determining which data components are necessary for the successful completion of tasks.
- C4.4 Know the process for determining the accuracy and completeness of data.

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C5.0 *Students know how to read, interpret, and extract information from medical and other documents:*

- C5.1 Know how to code information and develop summaries (abstracts) for use by other medical personnel by using appropriate medical terminology.
- C5.2 Know how to determine the information needed to record charges and reimbursements accurately.
- C5.3 Know how to assess and apply information for regulatory and legal purposes.

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## D. Support Services Pathway

The standards for the Support Services Pathway apply to occupations or job functions, involving direct or indirect patient and client care, that contribute to support systems in the health care environment.

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*D1.0 Students understand the responsibilities of their roles and perform their tasks safely by using appropriate guidelines:*

- D1.1 Understand the process for evaluating operational systems and determining processes for improvement.
  - D1.2 Know how to provide support to standardization, consolidation, and re-engineering processes.
  - D1.3 Know the process for evaluating compliance with corporate, legal, regulatory, and accreditation standards, ethics, and codes.
  - D1.4 Understand the importance of coordinating intradepartmental activities, including event planning and logistics, with outside agencies and contractors.
  - D1.5 Know the process for monitoring clients' expectations by using plans to promote satisfaction and measurement tools to ensure sufficiency of products and delivery of services.
- 

*D2.0 Students understand the protocols and practices necessary to maintain a clean and healthy work environment:*

- D2.1 Know how to evaluate potential causes and methods of transmitting infections and how to apply standard precautionary guidelines.
  - D2.2 Use various manual and mechanical decontamination and sterilization techniques and procedures.
  - D2.3 Carry out hazardous waste disposal policies and procedures, including documentation, to ensure that regulated waste is handled, packaged, stored, and disposed of in accordance with federal, state, and local regulations.
  - D2.4 Know the process for implementing a waste management program, including the recycling and reduction of regulated medical, solid, hazardous, chemical, and radioactive waste materials.
  - D2.5 Use appropriate inventory and control systems to purchase materials, supplies, and capital equipment.
- 

*D3.0 Students use principles and techniques of resource management to make appropriate decisions:*

- D3.1 Know the procedures and processes for the selection, acquisition, distribution, and maintenance of equipment and understand preventive maintenance for buildings and equipment.
- D3.2 Know the process for evaluating competitive pricing, terms, and service levels to support product recommendations.



- D3.3 Know the process for developing inventory-reduction targets to achieve the financial goals of health care organizations.
- D3.4 Use distribution strategies and systems to ensure the optimal flow of materials.
- 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.
- D3.6 Understand the department's labor distribution reports to ensure the proper allocation of resources for projects and operations.

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*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 environments:*

- D4.1 Know the federal, state, and local regulations that apply to the design and construction of a health care facility.
- D4.2 Know the process for analyzing the therapeutic and functional aspects of color, decor, and furnishings as well as the process for coordinating facility furnishings and finishes in accordance with appropriate safety codes.
- D4.3 Know how to maintain a facility in good repair.

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## E. Therapeutic Services Pathway

The standards for the Therapeutic Services Pathway apply to occupations or functions that affect the ongoing health status of patients and clients. The standards specify the knowledge and skills needed by professionals pursuing careers in this pathway.

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*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:*

- E1.1 Know how to evaluate the ability of patients and clients to understand the information provided.
  - E1.2 Use appropriate communication strategies with patients and clients.
  - E1.3 Use appropriate responses to the health care needs of patients and clients.
- 

*E2.0 Students understand the protocol and regulatory guidelines for collecting information about patients and clients, for identifying and responding to the health care needs of patients and clients, and for reporting the results:*

- E2.1 Understand the collection and formatting of information by using facility protocols and regulatory guidelines.
  - E2.2 Use medical terminology appropriate to therapeutic services to interpret and communicate procedures and observations.
- 

*E3.0 Students understand the purpose and components of a treatment plan:*

- E3.1 Understand the roles and responsibilities, within their scope of practice, that contribute to the design and implementation of a treatment plan.
  - E3.2 Understand the process of prioritizing and organizing work in accordance with the patients' and clients' treatment plans.
  - E3.3 Determine the resources available for the effective implementation of treatment plans for patients and clients.
  - E3.4 Use equipment and instruments in accord with manufacturers' guidelines and accepted safety practices.
  - E3.5 Know the process for the documentation of actions in accord with the facility's protocol and regulatory guidelines.
- 

*E4.0 Students understand their role and scope of practice in monitoring, assessing, and reporting the health status of patients and clients:*

- E4.1 Understand the process for monitoring patients' and clients' responses to administered treatments and procedures.
- E4.2 Understand the process for reporting patients' and clients' responses to administered treatments and procedures.
- E4.3 Know the process for assessing patients' and clients' responses to administered treatments and procedures.


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- E5.0 *Students know how to evaluate patients' and clients' needs, abilities, and challenges to determine whether treatment goals are being reached:*
- E5.1 Use the appropriate evaluation tools to assess patients and clients.
  - E5.2 Understand the process for revising or creating modifications to treatment plans on the basis of information gathered.



# Hospitality, Tourism, and Recreation Industry Sector

## *Career Pathways*

- ◆ Food Science, Dietetics, and Nutrition
- ◆ Food Service and Hospitality
- ◆ Hospitality, Tourism, and Recreation



# Hospitality, Tourism, and Recreation Industry Sector

The Hospitality, Tourism, and Recreation sector provides students with the academic and technical preparation to pursue high-demand and high-skill careers in these related and growing industries. The sector encompasses three distinct, yet interrelated, career pathways: Food Science, Dietetics, and Nutrition; Food Service and Hospitality; and Hospitality, Tourism, and Recreation. The foundation standards include core, comprehensive technical knowledge and skills that prepare students for learning in the pathways. The knowledge and skills are acquired within a sequential, standards-based pathway program that integrates hands-on and project- and work-based instruction as well as internship, community classroom, work experience, apprenticeship, and cooperative career technical education. Standards included in the Hospitality, Tourism, and Recreation sector are designed to prepare students for technical training, postsecondary education, and entry to a career.

## FOUNDATION STANDARDS

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### 1.0 Academics

Students understand the academic content required for entry into postsecondary education and employment in the Hospitality, Tourism, and Recreation sector.

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, and history–social science content standards adopted by the State Board of Education.)*

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#### 1.1 Mathematics

Specific applications of Number Sense standards (grade seven):

- (1.1) Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.
- (1.2) Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

- (1.3) Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
- (1.4) Differentiate between rational and irrational numbers.
- (1.5) Know that every rational number is either a terminating or a repeating decimal and be able to convert terminating decimals into reduced fractions.
- (1.6) Calculate the percentage of increases and decreases of a quantity.
- (1.7) Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.
- (2.1) Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base.
- (2.2) Add and subtract fractions by using factoring to find common denominators.
- (2.3) Multiply, divide, and simplify rational numbers by using exponent rules.
- (2.4) Use the inverse relationship between raising to a power and extracting the root of a perfect square integer; for an integer that is not square, determine without a calculator the two integers between which its square root lies and explain why.
- (2.5) Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers.

Specific applications of Mathematical Reasoning standards (grade seven):

- (1.1) Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
- (2.1) Use estimation to verify the reasonableness of calculated results.
- (2.2) Apply strategies and results from simpler problems to more complex problems.
- (2.3) Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- (2.4) Make and test conjectures by using both inductive and deductive reasoning.
- (2.5) Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- (2.6) Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- (2.7) Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- (2.8) Make precise calculations and check the validity of the results from the context of the problem.
- (3.1) Evaluate the reasonableness of the solution in the context of the original situation.
- (3.2) Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- (3.3) Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.

Specific applications of Algebra I standards (grades eight through twelve):

- (1.1) Students use properties of numbers to demonstrate whether assertions are true or false.
- (13.0) Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.
- (24.1) Students explain the difference between inductive and deductive reasoning and identify and provide examples of each.
- (24.2) Students identify the hypothesis and conclusion in logical deduction.
- (24.3) Students use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.

Specific applications of Geometry standards (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.

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## 1.2 Science

Specific applications of Chemistry standards (grades nine through twelve):

- (1.a) Students know how to relate the position of an element in the periodic table to its atomic number and atomic mass.
- (1.b) Students know how to use the periodic table to identify metals, semimetals, nonmetals, and halogens.
- (1.c) Students know how to use the periodic table to identify alkali metals, alkaline earth metals and transition metals, trends in ionization energy, electronegativity, and the relative sizes of ions and atoms.
- (1.d) Students know how to use the periodic table to determine the number of electrons available for bonding.
- (1.e) Students know the nucleus of the atom is much smaller than the atom yet contains most of its mass.
- (1.f) Students know how to use the periodic table to identify the lanthanide, actinide, and transactinide elements and know that the transuranium elements were synthesized and identified in laboratory experiments through the use of nuclear accelerators.
- (1.g) Students know how to relate the position of an element in the periodic table to its quantum electron configuration and to its reactivity with other elements in the table.
- (1.h) Students know the experimental basis for Thomson's discovery of the electron, Rutherford's nuclear atom, Millikan's oil drop experiment, and Einstein's explanation of the photoelectric effect.
- (1.i) Students know the experimental basis for the development of the quantum theory of atomic structure and the historical importance of the Bohr model of the atom.

- (1.j) Students know that spectral lines are the result of transitions of electrons between energy levels and that these lines correspond to photons with a frequency related to the energy spacing between levels by using Planck's relationship ( $E = hv$ ).
- (2.a) Students know atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds.
- (2.b) Students know chemical bonds between atoms in molecules such as  $H^2$ ,  $CH^4$ ,  $NH^3$ ,  $H^2CCH^2$ ,  $N^2$ ,  $Cl^2$ , and many large biological molecules are covalent.
- (2.c) Students know salt crystals, such as NaCl, are repeating patterns of positive and negative ions held together by electrostatic attraction.
- (2.d) Students know the atoms and molecules in liquids move in a random pattern relative to one another because the intermolecular forces are too weak to hold the atoms or molecules in a solid form.
- (2.e) Students know how to draw Lewis dot structures.
- (2.f) Students know how to predict the shape of simple molecules and their polarity from Lewis dot structures.
- (2.g) Students know how electronegativity and ionization energy relate to bond formulation.
- (2.h) Students know how to identify solids and liquids held together by van der Waals forces or hydrogen bonding and relate these forces to volatility and boiling/melting point temperatures.
- (5.a) Students know the observable properties of acids, bases, and salt solutions.
- (5.b) Students know acids are hydrogen-ion-donating and bases are hydrogen-ion-accepting substances.
- (5.c) Students know strong acids and bases fully dissociate and weak acids and bases partially dissociate.
- (5.d) Students know how to use the pH scale to characterize acid and base solutions.
- (5.e) Students know the Arrhenius, Brønsted-Lowry, and Lewis acid-base definitions.
- (5.f) Students know how to calculate pH from the hydrogen-ion concentration.
- (5.g) Students know buffers stabilize pH in acid-base reactions.
- (10.a) Students know large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits.
- (10.b) Students know the bonding characteristics of carbon that result in the formation of a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.
- (10.c) Students know amino acids are the building blocks of proteins.
- (10.d) Students know the system for naming the ten simplest linear hydrocarbons and isomers that contain single bonds, simple hydrocarbons with double and triple bonds, and simple molecules that contain a benzene ring.
- (10.e) Students know how to identify the functional groups that form the basis of alcohols, ketones, ethers, amines, esters, aldehydes, and organic acids.
- (10.f) Students know the R-group structure of amino acids and know how they combine to form the polypeptide backbone structure of proteins.



Specific applications of Investigation and Experimentation standards (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.
- (1.d) Formulate explanations by using logic and evidence.
- (1.m) Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.

### 1.3 *History–Social Science*

Specific applications of Chronological and Spatial Thinking standards (grades nine through twelve):

- (1) Students compare the present with the past, evaluating the consequences of past events and decisions and determining the lessons that were learned.
- (2) Students analyze how change happens at different rates at different times; understand that some aspects can change while others remain the same; and understand that change is complicated and affects not only technology and politics but also values and beliefs.

Specific applications of Historical Interpretation standards (grades nine through twelve):

- (1) Students show the connections, causal and otherwise, between particular historical events and larger social, economic, and political trends and developments.

Specific applications of World History, Culture, and Geography: The Modern World standards (grade ten):

- (10.11) Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (11.8) Students analyze the economic boom and social transformation of post-World War II America.
  - (11.8.1) Trace the growth of service sector, white collar, and professional sector jobs in business and government.
  - (11.8.2) Describe the significance of Mexican immigration and its relationship to the agricultural economy, especially in California.
  - (11.8.7) Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural technology.
  - (11.8.8) Discuss forms of popular culture, with emphasis on their origins and geographic diffusion (e.g., jazz and other forms of popular music, professional sports, architectural and artistic styles).

Specific applications of Principles of Economics standards (grade twelve):

- (12.1) Students understand common economic terms and concepts and economic reasoning.
  - (12.1.1) Examine the causal relationship between scarcity and the need for choices.
  - (12.1.2) Explain opportunity cost and marginal benefit and marginal cost.
  - (12.1.3) Identify the difference between monetary and nonmonetary incentives and how changes in incentives cause changes in behavior.
- (12.2) Students analyze the elements of America's market economy in a global setting.
  - (12.2.1) Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.
  - (12.2.2) Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.
  - (12.2.3) Explain the roles of property rights, competition, and profit in a market economy.
  - (12.2.4) Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.
  - (12.2.5) Understand the process by which competition among buyers and sellers determines a market price.
  - (12.2.6) Describe the effect of price controls on buyers and sellers.
  - (12.2.7) Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.
  - (12.2.8) Explain the role of profit as the incentive to entrepreneurs in a market economy.
- (12.3) Students analyze the influence of the federal government on the American economy.
  - (12.3.1) Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.
  - (12.3.3) Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.
- (12.4) Students analyze the elements of the U.S. labor market in a global setting.
  - (12.4.1) 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.
  - (12.4.2) Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.
  - (12.4.3) Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.

- (12.6) Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States’s borders.
- (12.6.1) Identify the gains in consumption and production efficiency from trade, with emphasis on the main products and changing geographic patterns of twentieth-century trade among countries in the Western Hemisphere.
- (12.6.3) Understand the changing role of international political borders and territorial sovereignty in a global economy.
- (12.6.4) Explain foreign exchange, the manner in which exchange rates are determined, and the effects of the dollar’s gaining (or losing) value relative to other currencies.

## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English–language arts content standards adopted by the State Board of Education.)*

### 2.1 Reading

Specific applications of Reading Comprehension standards (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.
- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (2.3) Generate relevant questions about readings on issues that can be researched.
- (2.5) Extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration.
- (2.7) Critique the logic of functional documents by examining the sequence of information and procedures in anticipation of possible reader misunderstandings.

Specific applications of Reading Comprehension standards (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.

### 2.2 Writing

Specific applications of Writing Strategies and Applications standards (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.
- (1.4) Develop the main ideas within the body of the composition through supporting evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions).

- (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).
- (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.
- (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.
- (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.

Specific applications of Writing Strategies and Applications standards (grades eleven and twelve):

- (1.5) Use language in natural, fresh, and vivid ways to establish a specific tone.
- (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).
- (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.

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### 2.3 *Listening and Speaking*

Specific applications of Speaking Applications standards (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.

Specific applications of Speaking Applications standards (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.

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2.4 Understand the importance of effective nonverbal, oral, and written communication skills in getting and keeping a job.

2.5 Use appropriate vocabulary and the specialized terminology of the industry.

2.6 Understand verbal and nonverbal communication and respond appropriately.

2.7 Understand trends and new information by reading and interpreting the professional literature of the professions within a selected career pathway.

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## 3.0 Career Planning and Management

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

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, 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.
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## 4.0 Technology

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

- 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.
  - 4.4 Use appropriate technology in the chosen career pathway.
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## 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:

- 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.
  - 5.4 Apply decision-making skills to achieve balance in the multiple roles of personal, home, work, and community life.
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## 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:

- 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.

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## 7.0 Responsibility and Flexibility

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

- 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.
- 7.2 Understand the need to adapt to varied roles and responsibilities.
- 7.4 Understand that individual actions can affect the larger community.

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## 8.0 Ethics and Legal Responsibilities

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

- 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.

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## 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:

- 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, such as FHA-HERO, 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.

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## 10.0 Technical Knowledge and Skills (Consumer and Family Studies)

Students understand the essential knowledge and skills common to all pathways in the Hospitality, Tourism, and Recreation sector:

- 10.1 Understand the principles of nutrition and their relationship to good health through the life cycle.
- 10.2 Understand the basic principles of food safety and sanitation and the proper techniques for preparing and serving food.
- 10.3 Understand the principles of food purchasing, food preparation, and meal management in a variety of settings.
- 10.4 Understand commonly accepted food customs as well as table setting, meal service, and etiquette practices of the United States and other cultures.
- 10.5 Understand the aspects of science related to food preparation, product development, and nutrition.
- 10.6 Understand food production, processing, and distribution methods and the relationship of those techniques to consumer food supply and nutrition.
- 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.
- 10.8 Assess the individual, family, and workplace factors that influence decisions related to health, leisure, and recreation at each stage of the life cycle.
- 10.9 Understand how individuals apply strategies that enable them to manage personal and work responsibilities to enhance productivity in the workplace.
- 10.10 Understand how knowledge, skills, attitudes, and behaviors learned in consumer and family studies can be transferred to advanced training and education or careers in the hospitality, tourism, and recreation industry.

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## 11.0 Demonstration and Application

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



## PATHWAY STANDARDS

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### A. Food Science, Dietetics, and Nutrition Pathway

The Food Science, Dietetics, and Nutrition Pathway focuses on three specializations centered on the science of food and its relationship to the health and well-being of individuals. Students pursuing this career pathway learn about industry awareness; food safety and sanitation; workforce and organizational management; food, fitness, and wellness; nutritional requirements and processes; food chemistry and technology; research and product development; and marketing and public relations.

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*A1.0 Students understand key aspects of the food science, dietetics, and nutrition industry and the role of the industry in the local, state, national, and global economies:*

- A1.1 Evaluate the contributions of the various segments of the industry to local, state, national, and international economies.
  - A1.2 Understand the requirements and standards for employees in the industry, including education, training, licensures, and certifications.
  - A1.3 Distinguish core elements of the food science, dietetics, and nutrition industry from the supporting industries and regulatory agencies.
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*A2.0 Students understand important workforce and organizational management concepts:*

- A2.1 Know how to find information on the primary business procedures for food science, dietetics, and nutrition organizations.
  - A2.2 Know important management strategies for planning, decision making, shared responsibility, and negotiations.
  - A2.3 Understand the differences and importance of the main elements in day-to-day operational procedures at various types of food-related facilities.
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*A3.0 Students know the primary standards and regulations for safe food handling and sanitation practices:*

- A3.1 Know industry-recommended standards for personal grooming and hygiene.
  - A3.2 Understand safe and sanitary food-handling procedures as set forth by local, state, and federal health and safety codes, including reporting and dealing with violations of the food safety code.
  - A3.3 Understand procedures for preventing the spread of food-borne pathogens and illness.
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*A4.0 Students understand the relationship of basic nutritional principles and concepts to the physical and emotional well-being of individuals:*

- A4.1 Understand the anatomical structure and functions of the digestive system, including the biochemical processes involved in digestion, absorption, metabolism, and energy balance.

- A4.2 Analyze appropriate nutrient intake, diet, and energy expenditure for individuals of different ages and with different dietary and health needs.
- A4.3 Understand the relationship of emotional, psychological, and physiological needs to food intake and natural hunger cues.
- A4.4 Understand the concept of recommended diets for different dietary and health needs.

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A5.0 *Students understand the correlation of food and fitness to wellness:*

- A5.1 Know how research-based, recognized dietary guidelines relate to nutrition, fitness, and overall wellness.
- A5.2 Understand nutritional information needed to implement and sustain change in behavior and lifestyle management.
- A5.3 Analyze popular diets for recommendations that are consistent with or contrary to approved dietary guidelines.
- A5.4 Understand nutrient density as it relates to food quality and dietary choices for individual nutrition, fitness, and wellness goals.
- A5.5 Understand how social and cultural norms and barriers relate to the implementation of nutrition, fitness, and wellness changes.

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A6.0 *Students understand the basics of community collaborative opportunities and methods of outreach in the field of nutrition, fitness, and wellness:*

- A6.1 Know the available community services, agencies, and outreach programs that provide nutrition, fitness, and wellness information and services.
- A6.2 Know the differences in services and outreach methods of community organizations that provide nutrition, fitness, and wellness information and services.
- A6.3 Understand the influence of cultural health-related practices and food preferences on the nutrition, fitness, and wellness of individuals.

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A7.0 *Students understand the basic principles of managing and operating food service outreach programs:*

- A7.1 Know the types of community-based and institutional programs that provide food and nutrition outreach services.
- A7.2 Understand the factors that affect the management and operation of a food service outreach program.
- A7.3 Understand the training needs of an effective food service outreach staff.

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A8.0 *Students understand the basic principles of chemistry and physics related to changes in foods and food products during preparation, processing, and preservation:*

- A8.1 Understand important chemical and physical changes that occur during food preparation.
- A8.2 Know terminology, methods, and equipment used in the food science and technology industry.

- A8.3 Practice safe laboratory and equipment use and maintenance procedures.
- A8.4 Conduct scientific experiments using the scientific method.
- A8.5 Document experiments and maintain laboratory records.

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*A9.0 Students understand the basic principles of research and development, food analysis, and sensory evaluation in the field of food science and technology:*

- A9.1 Analyze research on food trends, value-added processing, genetic engineering, and irradiation.
- A9.2 Understand quality control, assurance standards, and the procedures for each used in research and development.
- A9.3 Prepare and test formulas for developing new food products.
- A9.4 Test food products by using controls, variables, and random sampling.
- A9.5 Understand the purpose, importance, and basic procedures of sensory evaluation experiments.

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*A10.0 Students understand the fundamental concepts of marketing and public relations used in the dissemination of information about food science, dietetics, and nutrition:*

- A10.1 Know the differences between public relations, advertising, and provision of accurate information to consumers.
- A10.2 Analyze the psychological affects of market branding, subliminal messages, and advertising on consumer choices.
- A10.3 Understand the influence of consumer trends and expectations on product development and marketing.
- A10.4 Understand the use of technical reports in preparing and disseminating information.
- A10.5 Understand the methods and importance of communicating accurate information to consumers about nutrition, food safety, and food products.

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## B. Food Service and Hospitality Pathway

The Food Service and Hospitality Pathway focuses on the key aspects of the industry. Students pursuing this career pathway have in-depth, hands-on experiences that emphasize industry awareness, sanitation and safe food handling, food and beverage production and service, nutrition, food service management, and customer service.

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*B1.0 Students understand major aspects of the food service and hospitality industry and the role of the industry in local, state, national, and global economies:*

- B1.1 Know how the various segments of the industry contribute to local, state, national, and international economies.
  - B1.2 Analyze the advantages and disadvantages of the working conditions and of various careers in the food service and hospitality industry.
  - B1.3 Understand the relationship between industry trends and local, state, national, and international economic trends.
  - B1.4 Distinguish core elements of the food service and hospitality industry from various supporting industries.
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*B2.0 Students understand the basics of safe work habits, security, and emergency procedures required in food service and hospitality establishments:*

- B2.1 Understand the basic procedures for the safety of employees and guests, including the procedures for emergency situations.
  - B2.2 Understand the role of the California Occupational Safety and Health Administration in regulating practices in the food service and hospitality industry.
  - B2.3 Know the causes, prevention, and treatment of common accidents and the reporting procedures involved.
  - B2.4 Know the purpose of and information in material safety data sheets.
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*B3.0 Students understand the basic principles of sanitation and safe food handling:*

- B3.1 Understand basic local, state, and federal sanitation regulations as they pertain to food production and service.
- B3.2 Know the standards of personal grooming and hygiene required by local, state, and federal health and safety codes.
- B3.3 Understand safe and sanitary procedures in all food handling, including food receiving, storage, production, service, and cleanup.
- B3.4 Know types of food contamination, the potential causes, including cross-contamination, and methods of prevention.
- B3.5 Know the essential principles of Hazard Analysis Critical Control Points, including the use of flowcharts.
- B3.6 Understand the purpose of and process for required certification (e.g., ServSafe).

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*B4.0 Students understand the basics of food service and hospitality management:*

- B4.1 Analyze the relationship of effective management and business procedures to important outcomes, such as profitability, productivity, workplace atmosphere, consumer and guest satisfaction, and business growth.
- B4.2 Understand and interpret business plans.
- B4.3 Understand the differences in goals and organizational management of various food service businesses.
- B4.4 Understand the importance of specific human resource practices and procedures that address workplace diversity, harassment, personal safety, and discrimination.
- B4.5 Know the responsibilities of management, such as ensuring safe work practices and conditions and complying with important laws and regulations that affect employment (e.g., wage and hour laws, tenant status, and accommodation of minors).

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*B5.0 Students understand the basics of systems operations and the importance of maintaining facilities, equipment, tools, and supplies:*

- B5.1 Understand how various departments in a food service facility contribute to the economic success of a business.
- B5.2 Know the procedures for maintaining inventories; ordering food, equipment, and supplies; and storing and restocking supplies.
- B5.3 Prioritize tasks and plan work schedules based on budget and personnel.
- B5.4 Understand the relationship between facilities management and profit and loss, including the costs of breakage, theft, supplies use, and decisions for repairs or replacement.
- B5.5 Know the types of materials and supplies used in the maintenance of facilities, including the identification of the hazardous environmental and physical properties of chemicals and the use of material safety data sheets.
- B5.6 Understand the procedures for cleaning, maintaining, and repairing facilities and equipment and the importance of preventive maintenance.

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*B6.0 Students understand and apply the basics of food preparation in professional and institutional kitchens:*

- B6.1 Know the qualities and properties of food items and ingredients used in food preparation.
- B6.2 Use, maintain, and store the tools, utensils, equipment, and appliances appropriate for preparing a variety of food items.
- B6.3 Know the principle of *mise en place*, including the placement and order of use of ingredients, tools, and supplies.
- B6.4 Prepare food by using the correct techniques and procedures specified in recipes and formulas.
- B6.5 Use plating techniques, including accurate portioning and aesthetic presentation skills.

- B6.6 Plan and follow a food production schedule, including timing and prioritizing of tasks and activities.

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*B7.0 Students understand and apply the basics of baking, pastry, and dessert preparation in professional and institutional kitchens:*

- B7.1 Know the qualities and properties of food items and ingredients used for baked goods, pastries, and desserts.
- B7.2 Use, maintain, and store the tools, utensils, equipment, and appliances appropriate for preparing, serving, and storing baked goods, pastries, and desserts.
- B7.3 Know the principle of *mise en place*, including the placement and order of use of the ingredients, tools, and supplies needed to produce baked goods, pastries, and desserts.
- B7.4 Produce baked goods, pastries, and desserts by using correct techniques, procedures, and various finishing techniques.

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*B8.0 Students understand and apply the knowledge and skills essential for effective customer service:*

- B8.1 Understand the importance of customer service to the success of the food service establishment.
- B8.2 Understand the concept of exceptional customer service and know ways of anticipating the needs and desires of customers to exceed their expectations.
- B8.3 Know common customer complaints and the service solutions for preventing or resolving complaints.
- B8.4 Understand the roles of management and employees in effectively meeting the needs of culturally and generationally diverse customers.
- B8.5 Interact with customers in a positive, responsive, and professional manner.

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*B9.0 Students understand and apply the basic procedures and skills needed for food and beverage service:*

- B9.1 Understand the concept of *mise en place* in relation to food and beverage service.
- B9.2 Understand the required duties of various positions, including those of the host/hostess, wait staff, bus person, and others related to opening, closing, change-of-shift, and preparatory work.
- B9.3 Use safe, efficient, and proper procedures for setting, serving, maintaining, and bussing tables.
- B9.4 Use proper techniques for customer service, including greeting, seating, presenting and explaining menu items, and taking customer orders.
- B9.5 Use appropriate, effective, and efficient techniques for writing food and beverage orders, relaying orders to the kitchen, coordinating and assembling food orders, preparing and presenting checks to customers, and processing payments.

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*B10.0 Students understand and apply basic nutritional concepts in meal planning and food preparation:*

- B10.1 Understand basic nutritional principles and know how to use food preparation techniques that conserve nutrients.
- B10.2 Interpret nutritional or ingredient information from food labels and fact sheets and analyze menu items to meet the dietary needs of individuals.
- B10.3 Understand the process for creating nutritious, creative, and profitable menus in accord with availability and demand.

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*B11.0 Students understand and apply the basic processes of costing and cost analysis in food and beverage production and service:*

- B11.1 Understand the importance and structure of standardized systems, such as the Uniform System of Accounts for Restaurants.
- B11.2 Know the components of a profit-and-loss statement.
- B11.3 Understand the importance of the menu as the primary source of revenue generation and cost control.
- B11.4 Calculate recipe costs and pricing per portion and compare the cost per cover to the theoretical cost.
- B11.5 Understand the customer's perception of value and its relationship to profit and loss.

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*B12.0 Students understand the fundamentals of successful sales and marketing methods:*

- B12.1 Understand basic marketing principles for maximizing revenue based on supply and demand.
- B12.2 Know the major market segments of the industry and understand how marketing principles and procedures can be applied to target audiences.
- B12.3 Understand the various types of entrepreneurial opportunities in the food service industry.
- B12.4 Analyze marketing strategies, including promotional selling and upgrading, and their effect on profits.
- B12.5 Know methods to develop and maintain long-term customer relations.

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## C. Hospitality, Tourism, and Recreation Pathway

The Hospitality, Tourism, and Recreation Pathway integrates various facets of the hospitality industry: lodging, travel, and tourism; event planning; theme parks, attractions, and exhibitions; and recreation. Students engaged in this pathway have broad experiences related to the specific industry segments, including industry awareness; organizational management; customer service; sales and marketing; facilities management; lodging; travel destinations; and reservations, ticketing, and itineraries.

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*C1.0 Students understand the major aspects of the hospitality, tourism, and recreation industry and the industry's role in local, state, national, and global economies:*

- C1.1 Understand the basic career paths in the industry in relation to personal aptitudes and abilities.
  - C1.2 Analyze the economic impact on and contributions of key segments of the industry to local, state, national, and international economies.
  - C1.3 Analyze the working conditions of various careers in the hospitality, tourism and recreation industry.
  - C1.4 Understand the relationship between industry trends and local, state, national, and international economic trends.
  - C1.5 Distinguish core elements of the hospitality, tourism, and recreation industry from those of various supporting industries.
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*C2.0 Students understand the basic elements of workforce and organizational management, including the roles and responsibilities of effective management and employees in the industry:*

- C2.1 Analyze the relationship of management techniques and appropriate business procedures (e.g., spreadsheets for payroll and inventories, tools for budgeting, recordkeeping, correspondence) to important outcomes (e.g., profitability, productivity, positive work environment, consumer and client satisfaction, business growth, business plans).
- C2.2 Understand how the mission and goals of a business affect operations in the hospitality, tourism, and recreation industry.
- C2.3 Know common safety, security, and emergency policies and procedures used in the hospitality, tourism, and recreation 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).
- C2.4 Assess the impact of the main laws and regulations (e.g., the requirements of the California Occupational Safety and Health Administration and the Americans with Disabilities Act, wage and hour laws, tenant status, and accommodation of minors) that affect accommodations and practices.
- C2.5 Understand the importance of specific human resource practices and procedures that address workplace diversity, harassment, personal safety, and discrimination.



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C3.0 *Students understand and apply the knowledge and skills essential for effective guest services in the hospitality, tourism, and recreation industry sector:*

- C3.1 Understand the importance of guest services to the success of the industry.
- C3.2 Understand the concept of exceptional guest service.
- C3.3 Anticipate the needs, desires, and interests of guests in order to exceed their expectations.
- C3.4 Know common guest complaints and the service solutions for preventing or resolving them.
- C3.5 Understand the roles of management and employees in effectively meeting the needs of culturally and generationally diverse guests.
- C3.6 Interact with guests in a positive, responsive, and professional manner.

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C4.0 *Students understand successful sales and marketing methods:*

- C4.1 Understand basic marketing principles for maximizing revenue based on supply and demand.
- C4.2 Analyze marketing strategies, including promotional selling and upgrading, and their effect on profits.
- C4.3 Know the major market segments of the hospitality, tourism, and recreation industry.
- C4.4 Analyze the way in which basic marketing principles and procedures can be applied to targeting an audience.
- C4.5 Understand ways of developing and maintaining long-term guest relationships.

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C5.0 *Students understand the basics of systems operations and the importance of maintaining facilities, equipment, tools, and supplies:*

- C5.1 Understand how essential departments in a hospitality, tourism, and recreation business contribute to economic success.
- C5.2 Know the types of materials and supplies used in the maintenance of facilities, including the identification of the hazardous properties of chemicals and the use of material safety data sheets.
- C5.3 Understand the procedures for cleaning, maintaining, and repairing facilities and equipment and the importance of preventive maintenance.
- C5.4 Know procedures for maintaining inventories, requisitioning equipment and tools, and storing and restocking supplies.
- C5.5 Analyze work to be completed, prioritize tasks, and prepare a schedule to meet facility and personnel needs within an allotted budget.
- C5.6 Understand the relationship between facilities management and profit and loss, including the costs of breakage, theft, supplies use, and decisions for repairs or replacement.

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- C6.0 *Students understand and apply procedures for common types of financial transactions:*
- C6.1 Understand procedures for handling cash transactions, such as balancing cash, handling cash control, converting currency, and identifying counterfeit currency.
  - C6.2 Understand the procedures for handling noncash transactions (e.g., credit cards, debit cards, ATM cards, money orders, personal checks, coupons, discounts, online transactions).
  - C6.3 Handle all financial transactions in an accurate, professional, and ethical manner.
  - C6.4 Know the impact of identity theft on the hospitality, tourism, and recreation industry.
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- C7.0 *Students understand the essential aspects of the lodging industry:*
- C7.1 Distinguish between the segments of the lodging industry, such as motels, resorts, all-suites, extended-stay hotels, convention hotels, boutique hotels, and bed-and-breakfast facilities.
  - C7.2 Understand the internal hierarchy and departmental interrelationships of lodging establishments.
  - C7.3 Understand the required duties of various positions, including those of front desk and other service providers, in relation to the functions of the business (e.g., checking guests in and out, greeting, assessing needs, delivering services, and closing the transaction).
  - C7.4 Know the types of food service offered at various lodging facilities.
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- C8.0 *Students understand the basics of global and domestic physical and cultural geography in relation to the hospitality, tourism, and recreation industry:*
- C8.1 Understand fundamental ways in which physical geography, culture, politics, and the economy affect world travel and tourism.
  - C8.2 Understand the types of basic information that international travelers need (e.g., physical geography, time zones, International Date Line, rights and responsibilities, laws, and customs).
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- C9.0 *Students understand the basic processes of making reservations, ticketing, and developing travel itineraries:*
- C9.1 Know the characteristics and configurations of common air and rail carriers, cruise ships, and attractions, including the most frequently used codes and terminology for ports of travel.
  - C9.2 Understand the costs and other travel considerations involved in creating itineraries to meet client needs, including types of travel, types of fares, basic fare codes, costs, penalty charges, and types of accommodations.
  - C9.3 Understand important travel information, including insurance needs, vehicle rentals, passports, visas, and health documents, as well as how to plan specialty tour packages to fit client needs.

- C9.4 Understand the basic purpose, function, and operation of various travel systems and authorities, including the Airline Reporting Corporation, the Federal Aviation Authority, the major centralized reservation systems, and the Computerized Reservation System.

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*C10.0 Students understand the fundamental purpose and basic organizational structure of a variety of theme parks, attractions, and exhibitions:*

- C10.1 Analyze the ways in which the purposes of various properties (e.g., entertainment, education, and community relations) affect their financial structure.
- C10.2 Understand the internal hierarchy and departmental relationships of theme parks, attractions, or exhibitions.
- C10.3 Understand how the various internal departments of theme parks, attractions, or exhibitions interrelate and support each other.
- C10.4 Know the purposes, implications, and strategies of special promotions, such as season passes, multiple-day visits, retail items, and discount coupons.

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*C11.0 Students understand and apply the fundamentals of planning events for a diverse clientele:*

- C11.1 Understand the purposes and target audiences of various venues.
- C11.2 Plan special events (e.g., meetings, trade shows, fairs, conferences) based on specific themes, budgets, agendas, space and security needs, and itineraries.
- C11.3 Know how to establish business relationships with a variety of locations, food suppliers, and other vendors.
- C11.4 Develop schedules, registration tools, event materials, and programs.
- C11.5 Know procedures for setting up facilities, equipment, and supplies for a meeting.
- C11.6 Know the essential procedures for planning, promoting, publicizing, coordinating, and evaluating a program or event.

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*C12.0 Students understand the value of recreation and the fundamentals of recreational facilities and services:*

- C12.1 Know the outdoor recreational opportunities that promote physical and mental health.
- C12.2 Understand and evaluate the requirements of outdoor recreational businesses, including benefits, risks, required skills, and costs.
- C12.3 Know the variety of parklands, wilderness areas, and waterways available for recreation.
- C12.4 Understand the departments, functions, and restrictions of public and private parks and recreational facilities and the outdoor recreational programs they offer.
- C12.5 Understand how the needs of various clients may be met through appropriate outdoor recreational activities, outdoor experiences, special tours, and environmentally responsible education.
- C12.6 Know the types of insurance, licenses, and permits needed for the operation and management of various popular outdoor activities.

The background of the page features a large, light gray watermark of the Seal of the Board of Education of the State of Alaska. The seal is circular and contains a central figure of a woman in a helmet holding a spear, a bear, and various symbols of education and industry. The text "BOARD OF EDUCATION" and "STATE OF ALASKA" is visible around the perimeter of the seal.

# **Information Technology Industry Sector**

## *Career Pathways*

- ◆ Information Support and Services
- ◆ Media Support and Services
- ◆ Network Communications
- ◆ Programming and Systems Development



# Information Technology Industry Sector

Technology and the growing complexity of businesses have expanded the need for employees who can analyze, design, and manage information. Skills for evaluating data, the ability to work with people, and clear communication are companion components for careers in information technology systems. Employment opportunities for technically and professionally trained persons are outstanding in this emerging career path. After mastering basic technology skills, students can select one of many specializations in the field of technology.

## FOUNDATION STANDARDS

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### 1.0 Academics

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

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, and history–social science content standards adopted by the State Board of Education.)*

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#### 1.1 Mathematics

Specific applications of Number Sense standards (grade seven):

- (1.1) Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.
- (1.2) Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
- (1.3) Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
- (1.4) Differentiate between rational and irrational numbers.
- (1.5) Know that every rational number is either a terminating or a repeating decimal and be able to convert terminating decimals into reduced fractions.
- (1.6) Calculate the percentage of increases and decreases of a quantity.

- (1.7) Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

Specific applications of Statistics, Data Analysis, and Probability standards (grade seven):

- (1.1) Know various forms of display for data sets, including a stem-and-leaf plot or box-and-whisker plot; use the forms to display a single set of data or to compare two sets of data.
- (1.2) Represent two numerical variables on a scatterplot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level).
- (1.3) Understand the meaning of, and be able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.

Specific applications of Mathematical Reasoning standards (grade seven):

- (1.1) Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
- (2.1) Use estimation to verify the reasonableness of calculated results.
- (2.2) Apply strategies and results from simpler problems to more complex problems.
- (2.3) Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- (2.4) Make and test conjectures by using both inductive and deductive reasoning.
- (2.5) Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- (2.6) Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- (2.7) Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- (2.8) Make precise calculations and check the validity of the results from the context of the problem.
- (3.1) Evaluate the reasonableness of the solution in the context of the original situation.
- (3.2) Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- (3.3) Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.

Specific applications of Algebra I standards (grades eight through twelve):

- (1.1) Students use properties of numbers to demonstrate whether assertions are true or false.
- (5.0) Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.

- (13.0) Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.
- (15.0) Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.
- (24.1) Students explain the difference between inductive and deductive reasoning and identify and provide examples of each.
- (24.2) Students identify the hypothesis and conclusion in logical deduction.
- (24.3) Students use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.
- (25.1) Students use properties of numbers to construct simple, valid arguments (direct and indirect) for, or formulate counterexamples to, claimed assertions.
- (25.2) Students judge the validity of an argument according to whether the properties of the real number system and the order of operations have been applied correctly at each step.
- (25.3) Given a specific algebraic statement involving linear, quadratic, or absolute value expressions or equations or inequalities, students determine whether the statement is true sometimes, always, or never.

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### 1.2 Science

Specific applications of Investigation and Experimentation standards (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.
- (1.d) Formulate explanations by using logic and evidence.

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### 1.3 History–Social Science

Specific applications of World History, Culture and Geography: The Modern World standards (grade ten):

- (10.3) Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.
  - (10.3.1) Analyze why England was the first country to industrialize.
  - (10.3.2) Examine how scientific and technological changes and new forms of energy brought about massive social, economic, and cultural change (e.g., the inventions and discoveries of James Watt, Eli Whitney, Henry Bessemer, Louis Pasteur, Thomas Edison).
  - (10.3.3) Describe the growth of population, rural to urban migration, and growth of cities associated with the Industrial Revolution.
  - (10.3.4) Trace the evolution of work and labor, including the demise of the slave trade and the effects of immigration, mining and manufacturing, division of labor, and the union movement.

- (10.3.5) Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.
- (10.3.6) Analyze the emergence of capitalism as a dominant economic pattern and the responses to it, including Utopianism, Social Democracy, Socialism, and Communism.

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (11.11) Students analyze the major social problems and domestic policy issues in contemporary American society.
  - (11.11.1) Discuss the reasons for the nation’s changing immigration policy, with emphasis on how the Immigration Act of 1965 and successor acts have transformed American society.
  - (11.11.2) Discuss the significant domestic policy speeches of Truman, Eisenhower, Kennedy, Johnson, Nixon, Carter, Reagan, Bush, and Clinton (e.g., with regard to education, civil rights, economic policy, environmental policy).
  - (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.
  - (11.11.4) Explain the constitutional crisis originating from the Watergate scandal.
  - (11.11.5) Trace the impact of, need for, and controversies associated with environmental conservation, expansion of the national park system, and the development of environmental protection laws, with particular attention to the interaction between environmental protection advocates and property rights advocates.
  - (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.
  - (11.11.7) Explain how the federal, state, and local governments have responded to demographic and social changes such as population shifts to the suburbs, racial concentrations in the cities, Frostbelt-to-Sunbelt migration, international migration, decline of family farms, increases in out-of-wedlock births, and drug abuse.

Specific applications of Principles of Economics standards (grade twelve):

- (12.1) Students understand common economic terms and concepts and economic reasoning.
  - (12.1.1) Examine the causal relationship between scarcity and the need for choices.
  - (12.1.2) Explain opportunity cost and marginal benefit and marginal cost.
  - (12.1.3) Identify the difference between monetary and nonmonetary incentives and how changes in incentives cause changes in behavior.
  - (12.1.4) Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.
  - (12.1.5) Analyze the role of a market economy in establishing and preserving political and personal liberty (e.g., through the works of Adam Smith).
- (12.2) Students analyze the elements of America’s market economy in a global setting.



- (12.2.1) Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.
- (12.2.2) Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.
- (12.2.3) Explain the roles of property rights, competition, and profit in a market economy.
- (12.2.4) Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.
- (12.2.5) Understand the process by which competition among buyers and sellers determines a market price.
- (12.2.6) Describe the effect of price controls on buyers and sellers.
- (12.2.7) Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.
- (12.2.8) Explain the role of profit as the incentive to entrepreneurs in a market economy.
- (12.2.9) Describe the functions of the financial markets.
- (12.2.10) Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.
- (12.3) Students analyze the influence of the federal government on the American economy.
- (12.3.1) Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.
- (12.3.2) Identify the factors that may cause the costs of government actions to outweigh the benefits.
- (12.3.3) Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.
- (12.3.4) Understand the aims and tools of monetary policy and their influence on economic activity (e.g., the Federal Reserve).
- (12.4) Students analyze the elements of the U.S. labor market in a global setting.
- (12.4.1) 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.
- (12.4.2) Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.
- (12.4.3) Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.

- (12.4.4) Explain the effects of international mobility of capital and labor on the U.S. economy.
- (12.5) Students analyze the aggregate economic behavior of the U.S. economy.
  - (12.5.1) Distinguish between nominal and real data.
  - (12.5.2) Define, calculate, and explain the significance of an unemployment rate, the number of new jobs created monthly, an inflation or deflation rate, and a rate of economic growth.
  - (12.5.3) Distinguish between short-term and long-term interest rates and explain their relative significance.
- (12.6) Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States's borders.
  - (12.6.1) Identify the gains in consumption and production efficiency from trade, with emphasis on the main products and changing geographic patterns of twentieth-century trade among countries in the Western Hemisphere.
  - (12.6.2) Compare the reasons for and the effects of trade restrictions during the Great Depression compared with present-day arguments among labor, business, and political leaders over the effects of free trade on the economic and social interests of various groups of Americans.
  - (12.6.3) Understand the changing role of international political borders and territorial sovereignty in a global economy.
  - (12.6.4) Explain foreign exchange, the manner in which exchange rates are determined, and the effects of the dollar's gaining (or losing) value relative to other currencies.

## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English–language arts content standards adopted by the State Board of Education.)*

### 2.1 Reading

Specific applications of Reading Comprehension standards (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.
- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (2.3) Generate relevant questions about readings on issues that can be researched.
- (2.4) Synthesize the content from several sources or works by a single author dealing with a single issue; paraphrase the ideas and connect them to other sources and related topics to demonstrate comprehension.

- (2.5) Extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration.
- (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).
- (2.7) Critique the logic of functional documents by examining the sequence of information and procedures in anticipation of possible reader misunderstandings.

Specific applications of Reading Comprehension standards (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.

## 2.2 Writing

Specific applications of Writing Strategies and Applications standards (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.
- (1.4) Develop the main ideas within the body of the composition through supporting evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions).
- (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).
- (1.6) Integrate quotations and citations into a written text while maintaining the flow of ideas.
- (1.7) Use appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals (e.g., *Modern Language Association Handbook*, *The Chicago Manual of Style*).
- (1.8) Design and publish documents by using advanced publishing software and graphic programs.
- (1.9) Revise writing to improve the logic and coherence of the organization and controlling perspective, the precision of word choice, and the tone by taking into consideration the audience, purpose, and formality of the context.
- (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.
- (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.
- (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.
- (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.

Specific applications of Writing Strategies and Applications standards (grades eleven and twelve):

- (1.1) Demonstrate an understanding of the elements of discourse (e.g., purpose, speaker, audience, form) when completing narrative, expository, persuasive, or descriptive writing assignments.
- (1.3) Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.
- (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).
- (1.7) Use systematic strategies to organize and record information (e.g., anecdotal scripting, annotated bibliographies).
- (1.8) Integrate databases, graphics, and spreadsheets into word-processed documents.

- (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.
- (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.

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### 2.3 *Written and Oral English Language Conventions:*

Specific applications of English Language Conventions standards (grades nine and ten):

- (1.1) Identify and correctly use clauses (e.g., main and subordinate), phrases (e.g., gerund, infinitive, and participial), and mechanics of punctuation (e.g., semicolons, colons, ellipses, hyphens).
- (1.2) Understand sentence construction (e.g., parallel structure, subordination, proper placement of modifiers) and proper English usage (e.g., consistency of verb tenses).
- (1.3) Demonstrate an understanding of proper English usage and control of grammar, paragraph and sentence structure, diction, and syntax.
- (1.4) Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
- (1.5) Reflect appropriate manuscript requirements, including title page presentation, pagination, spacing and margins, and integration of source and support material (e.g., in-text citation, use of direct quotations, paraphrasing) with appropriate citations.

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### 2.4 *Listening and Speaking:*

Specific applications of Listening and Speaking Strategies and Applications standards (grade nine and ten):

- (1.1) Formulate judgments about the ideas under discussion and support those judgments with convincing evidence.
- (1.2) Compare and contrast the ways in which media genres (e.g., televised news, news magazines, documentaries, online information) cover the same event.

- (1.3) Choose logical patterns of organization (e.g., chronological, topical, cause and effect) to inform and to persuade, by soliciting agreement or action, or to unite audiences behind a common belief or cause.
- (1.7) Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.
- (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.
- (2.4) Deliver oral responses to literature:
  - a. Advance a judgment demonstrating a comprehensive grasp of the significant ideas of works or passages (i.e., make and support warranted assertions about the text).
  - b. Support important ideas and viewpoints through accurate and detailed references to the text or to other works.
  - c. Demonstrate awareness of the author's use of stylistic devices and an appreciation of the effects created.
  - d. Identify and assess the impact of perceived ambiguities, nuances, and complexities within the text.
- (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.
- (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.

Specific applications of Speaking Applications standards (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.
- 

- 2.5 Understand written business communication modes, such as memos, e-mail messages, and one-page executive summaries.
- 

### 3.0 Career Planning and Management

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

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, 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.
  - 3.7 Explore career opportunities in business through such programs as virtual enterprise, work experience, and internships.
- 

### 4.0 Technology

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

- 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.

- 4.4 Understand effective technologies used in Web site development and the Internet.
- 4.5 Know procedures for maintaining secure information, preventing loss, and reducing risk.

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## 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:

- 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.
- 5.4 Understand how financial systems and tools are used to solve business problems.

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## 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:

- 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 for health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.3 Understand the environmental and ergonomic risks associated with the use of business equipment and the financial impact of an unsafe work environment.

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## 7.0 Responsibility and Flexibility

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

- 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.



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## 8.0 Ethics and Legal Responsibilities

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

- 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.
- 8.4 Understand major local, state, and federal laws and regulations that affect business as well as the procedural requirements necessary for compliance.
- 8.5 Know how to design systems and applications to allow access to all users.

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## 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:

- 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, such as DECA (An Association of Marketing Students) and Future Business Leaders of America, 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 the attitudes and feelings of others.

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## 10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Information Technology sector:

- 10.1 Know how to use a variety of business- and industry-standard software and hardware, including major proprietary and open standards.
- 10.2 Understand the information technology components of major business functions (e.g., marketing, accounting, and human resource management) and their interrelationships.
- 10.3 Understand the economic effects of technology on a business in the global marketplace.

- 10.4 Know how financial systems and tools are used to perform business transactions through the use of technology.
- 10.5 Use technology and electronic media to manage the work flow and to provide feedback.
- 10.6 Understand the interrelationships between hardware components and supportive software.
- 10.7 Analyze the functions, features, and limitations of different operating systems, environments, applications, and utilities.
- 10.8 Know how to use appropriate help resources (e.g., help desks, online help, manuals) to install, configure, upgrade, diagnose, and repair operating systems, environments, applications, and utilities.

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## **11.0 Demonstration and Application**

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

## PATHWAY STANDARDS

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### A. Information Support and Services Pathway

Students in the Information Support and Services Pathway prepare for careers that involve the implementation of computer services and software, provision of technical assistance, creation of technical documentation, and management of information systems. Mastery of information technologies is the foundation for all successful business organizations today. Persons with expertise in information support and services are in high demand for a variety of positions in business and industry.

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*A1.0 Students understand the potential impact of information systems in different organizations:*

- A1.1 Evaluate the systems-development life cycle and develop appropriate plans to maintain a given system after assessing its impact on resources.
  - A1.2 Evaluate support needs for different data and systems configurations.
  - A1.3 Understand the necessity of and procedures for communicating and documenting technical support provided.
- 

*A2.0 Students understand the process of systems implementation:*

- A2.1 Understand how to develop the purpose and scope of a systems project.
  - A2.2 Understand the criteria and processes for evaluating the functions of information systems.
  - A2.3 Know the processes needed to install and maintain systems.
  - A2.4 Know appropriate documentation support for information systems.
- 

*A3.0 Students understand important aspects of project management:*

- A3.1 Analyze business problems by using functional and cost-benefit perspectives.
  - A3.2 Know common organizational, technical, and financial risks associated with the implementation and use of systems.
  - A3.3 Know the functions of various tools used to manage projects involving the development of information systems.
- 

*A4.0 Students understand the process necessary to accomplish a task by using effective resource management:*

- A4.1 Know how to acquire, use, and manage necessary internal and external resources when supporting various organizational systems.
  - A4.2 Understand how to identify and integrate various organizational systems to achieve maximum efficiency and effectiveness.
- 

*A5.0 Students understand the dynamics of systems management and control:*

- A5.1 Know appropriate policies and procedures to ensure the security and integrity of management systems.

- A5.2 Investigate, evaluate, select, and use major types of systems applications and vendors, including retail, manufacturing, and service management.

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*A6.0 Students understand how training and support ensure efficient, productive systems operations:*

- A6.1 Analyze technical support needs.  
A6.2 Use technical writing and communication skills to work effectively with diverse groups of people.  
A6.3 Understand the principles of a customer-oriented service approach to users.

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*A7.0 Students understand software applications and life-cycle phases:*

- A7.1 Know common industry-standard software and its applications.  
A7.2 Evaluate the effectiveness of software to solve specific problems.  
A7.3 Know a variety of sources for reference materials (e.g., online help, vendors' Web sites, online discussion groups, tutorials, manuals).  
A7.4 Diagnose and solve software application problems.  
A7.5 Know current and emerging industry-standard technology and trends.

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*A8.0 Students understand the importance of reading, writing, and comprehending documentation in a technical environment:*

- A8.1 Know appropriate search procedures for different types of information, sources, and queries.  
A8.2 Evaluate the accuracy, relevance, and comprehensiveness of retrieved information.  
A8.3 Analyze the effectiveness of online information resources to support collaborative tasks, research, publications, communications, and increased productivity.

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*A9.0 Students understand and implement quality assurance processes:*

- A9.1 Know the characteristics and functions of available quality assurance tools and procedures for a variety of situations.  
A9.2 Understand techniques for optimizing quality assurance processes.

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*A10.0 Students understand and implement database management systems:*

- A10.1 Know the variety of data types that are stored in database management systems.  
A10.2 Understand the ways in which tools for developing applications can be used to create information systems.  
A10.3 Understand the various structures appropriate for specific applications within database management systems.  
A10.4 Understand the development process of database schemas.  
A10.5 Understand the possibilities for and limitations of converting data between databases and various applications.

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## B. Media Support and Services Pathway

Students in the Media Support and Services Pathway prepare for careers that involve creating, designing, and producing multimedia products and services, including the development of digitally generated or computer-enhanced media used in business. Organizations of all types and sizes use digital media (e.g., CDs, DVDs, Web sites) to communicate with existing and potential customers. Media support experts can find jobs in organizations doing such work as creating e-business Web sites.

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*B1.0 Students understand the effective use of tools for media production, development, and project management:*

- B1.1 Know the basic functions of media design software, such as keyframe animation, two-dimensional design, and three-dimensional design.
  - B1.2 Use appropriate software to design and produce professional-quality images, documents, and presentations.
  - B1.3 Analyze the purpose of the media to determine the appropriate file format and level of compression.
  - B1.4 Analyze media and develop strategies that target the specific needs and desires of the audience.
  - B1.5 Understand the development and management process of a show (e.g., television programs, musicals, radio programs).
  - B1.6 Know the basic design elements necessary to produce effective print, video, audio, and Web-based media.
  - B1.7 Use technical skills (e.g., pagination, printing, folding, cutting, binding) to produce publishable materials.
- 

*B2.0 Students understand the effective use of communication software to access and transmit information:*

- B2.1 Know multiple ways in which to transfer information and resources (e.g., text, data, sound, video, still images) between software programs and systems.
  - B2.2 Understand the differences between various Internet protocols (e.g., http, ftp, mailto, telnet).
  - B2.3 Use multiple online search techniques and resources to acquire information.
  - B2.4 Know the appropriate ways to validate and cite Internet resources.
- 

*B3.0 Students understand the use of different types of peripherals and hardware appropriate to media and technology:*

- B3.1 Understand the appropriate peripherals and hardware needed to achieve maximum productivity for various projects.
- B3.2 Know how to identify and integrate various types of peripherals and hardware to meet project requirements.

- B3.3 Use various types of audio and video equipment (e.g., digital cameras, recorders, scanners, Web cams, CD and DVD recorders), as appropriate, for different projects.
- B3.4 Understand the types of media storage and the use of appropriate file formats, and know how to convert data between media and file formats.

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*B4.0 Students apply technical and interpersonal skills and knowledge to support the user:*

- B4.1 Use a logical and structured approach to isolate and identify the source of problems and to resolve problems.
- B4.2 Know the available resources for identifying and resolving problems.
- B4.3 Use technical writing and communication skills to work effectively with diverse groups of people.
- B4.4 Understand the principles of a customer-oriented service approach to users.

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*B5.0 Students understand and apply knowledge of effective Web page design and management:*

- B5.1 Understand the purpose, scope, and development of a Web site.
- B5.2 Know the relative features, strengths, and weaknesses of different authoring programs and cross-platform issues.
- B5.3 Use industry-standard programs to produce a Web-based business operation or simulation.
- B5.4 Know the tools needed to enable multimedia capabilities (e.g., still images, animated graphics, sound, video) for Web sites.
- B5.5 Know strategies for optimizing Web design for fast delivery and retrieval.
- B5.6 Know the tools needed to enable databases to collect data from Web site visitors (e.g., how to create forms and create a database of collected information and how to manage an online database) and the tools needed for general Web site management, including basic HTML coding, Web site statistical tracking, standard scripting languages, and advanced communications protocols.
- B5.7 Know the full process of Web hosting, including registering domain names, setting up Web hosting, setting up e-mail addresses, and recognizing privacy issues.
- B5.8 Understand the hardware (server) and software required for Web hosting.
- B5.9 Know the tools and process for registering Web sites with search directories and engines and for enabling e-commerce capabilities (e.g., sell products, create a shopping cart, handle credit card transactions).
- B5.10 Differentiate among various versions of Internet programming languages.

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## C. Network Communications Pathway

Students in the Network Communications Pathway prepare for careers that involve network analysis, planning, and implementation, including the design, installation, maintenance, and management of network systems. The successful establishment and maintenance of information technology infrastructure is critical to the success of almost every twenty-first-century organization. Employment continues to grow for persons with expertise in network communications.

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*C1.0 Students understand how to identify and analyze the customer's organizational network system needs and requirements:*

- C1.1 Evaluate emerging products, services, and business models in relation to the creation, setup, and management of network communication products and services.
- C1.2 Evaluate, create, and process voice, video, and data transmissions.
- C1.3 Understand the effective management of human, financial, and communications resources from the standpoints of the user and the provider.
- C1.4 Diagram physical and logical layouts of network communication systems.

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*C2.0 Students understand and use various types of networking models:*

- C2.1 Know the types of networks and their features and applications.
- C2.2 Know how to implement a functional wired and wireless network, including the installation and configuration of components, software, and plug-ins.
- C2.3 Understand the functions of various network devices, including network connectivity hardware.
- C2.4 Distinguish between the topologies and protocols of local area networks and those of wide area networks.
- C2.5 Understand the differences between various network environments (e.g., peer-to-peer, client-server, thin client, n-tier, internetworks, intranets, and extranets).
- C2.6 Evaluate, select, and deploy a variety of network architectures and protocols.
- C2.7 Apply appropriate technologies to improve network performance.
- C2.8 Identify, analyze, and evaluate emerging communications technologies for use in organizations.

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*C3.0 Students understand network maintenance and user-support services:*

- C3.1 Know common customer policies and procedures, including those for management of incidents.
- C3.2 Understand the security procedures necessary to maintain and support a network.
- C3.3 Know the functions of common help-desk tools and resources, such as incident tracking, knowledge database, and staffing.
- C3.4 Understand effective methods of disseminating information and instruction to users.

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*C4.0 Students understand network project management:*

- C4.1 Analyze network system interdependencies and constraints.
- C4.2 Understand the processes used in managing and maintaining various types of electronic networks.
- C4.3 Understand the implications of major protocols and international standards and their impact on data transmission.

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*C5.0 Students understand network communication applications and infrastructure:*

- C5.1 Know the appropriate uses of communication services, products, and applications.
- C5.2 Use a variety of online services (e.g., purchasing, selling, tracking, communicating, banking, investing).
- C5.3 Evaluate the features of communications software products in terms of their appropriateness to organizational tasks.
- C5.4 Configure compatible systems across various platforms and types of media.

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*C6.0 Students understand network administration through the monitoring of the information and network systems:*

- C6.1 Understand the importance of classifying appropriate monitoring devices and procedures for quick identification and prevention of security violations.
- C6.2 Know policies and procedures for routine administration (e.g., user agreement, incident reporting, recovery for users).
- C6.3 Know common potential risks and entrance points, including internal and external risks, and the tools used to neutralize them (e.g., firewalls; monitoring; antivirus, spyware, and spam protection).
- C6.4 Know common techniques for disaster prevention and recovery.



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## D. Programming and Systems Development Pathway

Students in the Programming and Systems Development Pathway prepare for careers that involve the design, development, and implementation of computer systems and software. Those careers require knowledge of computer operating systems, programming languages, and software development. Persons with expertise in programming and software development work with cutting-edge technologies to develop tomorrow's products for use by businesses and consumers.

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*D1.0 Students understand the strategies necessary to define and analyze systems and software requirements:*

- D1.1 Develop information technology-based strategies and project plans to solve specific problems.
  - D1.2 Know how systems and software requirements are determined in various situations.
  - D1.3 Know the effective use of tools for software development.
  - D1.4 Know the software development process.
- 

*D2.0 Students understand programming languages:*

- D2.1 Know the fundamentals of programming languages and concepts.
  - D2.2 Compare programs by using control structures, procedures, functions, parameters, variables, error recovery, and recursion.
  - D2.3 Understand digital logic, machine-level representation of data, memory-system organization, and use of assembly-level programming architecture.
- 

*D3.0 Students understand the creation and design of a software program:*

- D3.1 Analyze customers' needs and requirements for software.
  - D3.2 Know how specifications and codes are developed for new and existing software applications.
  - D3.3 Understand the abstract organization of information and how programs maintain the properties of the data structure while they perform such operations as search, insert, or load-balancing.
  - D3.4 Know multiple ways in which to store, retrieve, and access information.
  - D3.5 Understand how to track software versions.
- 

*D4.0 Students understand the process of testing, debugging, and maintaining programs to meet specifications:*

- D4.1 Know the steps involved in the software-testing process.
- D4.2 Know the methodologies of program maintenance to preserve intended program applications and the operation of scheduled batch jobs and real-time jobs.

- D4.3 Know how different systems and associated utilities perform such functions as file management, backup and recovery, and execution of programs.
- D4.4 Understand the differences between simple and multiuser operating systems.

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*D5.0 Students understand the importance of quality assurance tasks in producing effective and efficient products:*

- D5.1 Know the standards and requirements for software quality assurance.
- D5.2 Know common quality assurance tasks and their place in the development process.
- D5.3 Understand the ways in which specification changes and technological advances can require the modification of programs.
- D5.4 Know various sorting and searching methods and their comparative advantages.
- D5.5 Know the characteristics of reliable, effective, and efficient products.

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*D6.0 Students understand the importance of effective interfaces in the interaction between humans and computer systems:*

- D6.1 Understand how to support access, privacy, and high ethical standards in computing.
- D6.2 Use knowledge of cognitive, physical, and social interactions to create and design user-friendly computer practices and applications that meet the needs of the market.



# **Manufacturing and Product Development Industry Sector**

## *Career Pathways*

- ◆ Graphic Arts Technology
- ◆ Integrated Graphics Technology
- ◆ Machine and Forming Technology
- ◆ Welding Technology



# Manufacturing and Product Development Industry Sector

The Manufacturing and Product Development sector provides a foundation in manufacturing processes and systems, including machine tool, welding, graphic communications, and graphic design, for secondary students in California. Students engage in an instructional program that integrates academic and technical preparation and focuses on career awareness, career exploration, and skill preparation in four pathways. The pathways emphasize real-world, occupationally relevant experiences of significant scope and depth in manufacturing and in graphic communication. The knowledge and skills are acquired within a sequential, standards-based pathway program that integrates hands-on, project-based, and work-based instruction as well as internship, community classroom, work experience, apprenticeship, and cooperative career technical education. Standards included in the Manufacturing and Product Development sector are designed to prepare students for technical training, postsecondary education, and entry to a career.

## FOUNDATION STANDARDS

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### 1.0 Academics

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

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, history–social science, and visual and performing arts content standards adopted by the State Board of Education.)*

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#### 1.1 Mathematics

Specific applications of Number Sense standards (grade seven):

- (1.1) Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.

- (1.2) Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
- (1.3) Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
- (1.4) Differentiate between rational and irrational numbers.
- (1.5) Know that every rational number is either a terminating or a repeating decimal and be able to convert terminating decimals into reduced fractions.
- (1.6) Calculate the percentage of increases and decreases of a quantity.
- (1.7) Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

Specific applications of Measurement and Geometry standards (grade seven):

- (2.4) Relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units ( $1 \text{ square foot} = 144 \text{ square inches}$  or  $[1 \text{ ft}^2] = [144 \text{ in}^2]$ ,  $1 \text{ cubic inch}$  is approximately  $16.38 \text{ cubic centimeters}$  or  $[1 \text{ in}^3] = [16.38 \text{ cm}^3]$ ).

Specific applications of Statistics, Data Analysis, and Probability standards (grade seven):

- (1.3) Understand the meaning of, and be able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.

Specific applications of Mathematical Reasoning standards (grade seven):

- (2.1) Use estimation to verify the reasonableness of calculated results.
- (2.2) Apply strategies and results from simpler problems to more complex problems.
- (2.3) Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- (2.4) Make and test conjectures by using both inductive and deductive reasoning.
- (2.5) Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- (2.6) Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- (2.7) Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- (2.8) Make precise calculations and check the validity of the results from the context of the problem.
- (3.1) Evaluate the reasonableness of the solution in the context of the original situation.
- (3.2) Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- (3.3) Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.

Specific applications of Algebra I standards (grades eight through twelve):

- (1.1) Students use properties of numbers to demonstrate whether assertions are true or false.
- (5.0) Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
- (6.0) Students graph a linear equation and compute the  $x$ - and  $y$ - intercepts (e.g., graph  $2x + 6y = 4$ ). They are also able to sketch the region defined by linear inequality (e.g., they sketch the region defined by  $2x + 6y < 4$ ).
- (8.0) Students understand the concepts of parallel lines and perpendicular lines and how those slopes are related. Students are able to find the equation of a line perpendicular to a given line that passes through a given point.
- (10.0) Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.
- (12.0) Students simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.
- (15.0) Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.

Specific applications of Geometry standards (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.
- (16.0) Students perform basic constructions with a straightedge and compass, such as angle bisectors, perpendicular bisectors, and the line parallel to a given line through a point off the line.
- (19.0) Students use trigonometric functions to solve for an unknown length of a side of a right triangle, given an angle and a length of a side.

## 1.2 Science

Specific applications of Physics standards (grades nine through twelve):

- (3.a) Students know heat flow and work are two forms of energy transfer between systems.
- (3.f) Students know the statement “Entropy tends to increase” is a law of statistical probability that governs all closed systems (second law of thermodynamics).
- (3.g) Students know how to solve problems involving heat flow, work, and efficiency in a heat engine and know that all real engines lose some heat to their surroundings.
- (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.
- (5.b) Students know how to solve problems involving Ohm’s law.

Specific applications of Investigation and Experimentation standards (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.
- (1.d) Formulate explanations by using logic and evidence.

### 1.3 *History–Social Science*

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (11.5) Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.
- (11.5.7) Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.
- (11.7) Students analyze America’s participation in World War II.
- (11.7.6) Describe major developments in aviation, weaponry, communication, and medicine and the war’s impact on the location of American industry and use of resources.
- (11.8) Students analyze the economic boom and social transformation of post-World War II America.
- (11.8.7) Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural technology.
- (11.11) Students analyze the major social problems and domestic policy issues in contemporary American society.
- (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.

### 1.4 *Visual and Performing Arts*

Specific applications of Visual Arts standards at the proficient level (grades nine through twelve):

- (2.3) Develop and refine skill in the manipulation of digital imagery (either still or video).

Specific applications of Visual Arts standards at the advanced level (grades nine through twelve):

- (5.3) Prepare portfolios of their original works of art for a variety of purposes (e.g., review for postsecondary application, exhibition, job application, and personal collection).

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## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English–language arts content standards adopted by the State Board of Education.)*

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### 2.1 Reading

Specific applications of Reading Comprehension standards (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.
- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (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).

Specific applications of Reading Comprehension standards (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.
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### 2.2 Writing

Specific applications of Writing Strategies standards (grade eight):

- (1.4) Plan and conduct multiple-step information searches by using computer networks and modems.
- (1.5) Achieve an effective balance between researched information and original ideas.
- (1.6) Revise writing for word choice; appropriate organization; consistent point of view; and transitions between paragraphs, passages, and ideas.

Specific applications of Writing Strategies and Applications standards (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.
- (1.4) Develop the main ideas within the body of the composition through supporting evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions).
- (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).
- (1.6) Integrate quotations and citations into a written text while maintaining the flow of ideas.



- (1.7) Use appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals (e.g., *Modern Language Association Handbook*, *The Chicago Manual of Style*).
- (1.8) Design and publish documents by using advanced publishing software and graphic programs.
- (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.
- (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.

Specific applications of Writing Strategies and Applications standards (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).
- (1.7) Use systematic strategies to organize and record information (e.g., anecdotal scripting, annotated bibliographies).
- (1.8) Integrate databases, graphics, and spreadsheets into word-processed documents.
- (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.

- (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.

### 2.3 *Written and Oral English Language Conventions*

Specific applications of English Language Conventions standards (grade eight):

- (1.4) Edit written manuscripts to ensure that correct grammar is used.
- (1.5) Use correct punctuation and capitalization.
- (1.6) Use correct spelling conventions.

Specific applications of English Language Conventions standards (grades eleven and twelve):

- (1.2) Produce legible work that shows accurate spelling and correct punctuation and capitalization.

### 2.4 *Listening and Speaking*

Specific applications of Listening and Speaking Strategies and Applications standards (grade eight):

- (1.1) Analyze oral interpretations of literature, including language choice and delivery, and the effect of the interpretations on the listener.
- (1.2) Paraphrase a speaker's purpose and point of view and ask relevant questions concerning the speaker's content, delivery, and purpose.
- (1.3) Organize information to achieve particular purposes by matching the message, vocabulary, voice modulation, expression, and tone to the audience and purpose.
- (1.4) Prepare a speech outline based upon a chosen pattern of organization, which generally includes an introduction; transitions, previews, and summaries; a logically developed body; and an effective conclusion.
- (1.5) Use precise language, action verbs, sensory details, appropriate and colorful modifiers, and the active rather than the passive voice in ways that enliven oral presentations.
- (1.6) Use appropriate grammar, word choice, enunciation, and pace during formal presentations.
- (1.7) Use audience feedback (e.g., verbal and nonverbal cues):
  - a. Reconsider and modify the organizational structure or plan.
  - b. Rearrange words and sentences to clarify the meaning.
- (1.8) Evaluate the credibility of a speaker (e.g., hidden agendas, slanted or biased material).

- (1.9) Interpret and evaluate the various ways in which visual image makers (e.g., graphic artists, illustrators, news photographers) communicate information and affect impressions and opinions.
- (2.1) Deliver narrative presentations (e.g., biographical, autobiographical):
  - a. Relate a clear, coherent incident, event, or situation by using well-chosen details.
  - b. Reveal the significance of, and the subject's attitude about, the incident, event, or situation.
  - c. Employ narrative and descriptive strategies (e.g., relevant dialogue, specific action, physical description, background description, comparison or contrast of characters).
- (2.2) Deliver oral responses to literature:
  - a. Interpret a reading and provide insight.
  - b. Connect the students' own responses to the writer's techniques and to specific textual references.
  - c. Draw supported inferences about the effects of a literary work on its audience.
  - d. Support judgments through references to the text, other works, other authors, or personal knowledge.
- (2.3) Deliver research presentations:
  - a. Define a thesis.
  - b. Record important ideas, concepts, and direct quotations from significant information sources and paraphrase and summarize all relevant perspectives on the topic, as appropriate.
  - c. Use a variety of primary and secondary sources and distinguish the nature and value of each.
  - d. Organize and record information on charts, maps, and graphs.
- (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.
- (2.5) Recite poems (of four to six stanzas), sections of speeches, or dramatic soliloquies, using voice modulation, tone, and gestures expressively to enhance the meaning.

Specific applications of Speaking Applications standards (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.
- (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.

Specific applications of Listening and Speaking Strategies and Applications standards (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
- (2.2) Deliver oral reports on historical investigations:
  - a. Use exposition, narration, description, persuasion, or some combination of those to support the thesis.
  - b. Analyze several historical records of a single event, examining critical relationships between elements of the research topic.
  - c. Explain the perceived reason or reasons for the similarities and differences by using information derived from primary and secondary sources to support or enhance the presentation.
  - d. Include information on all relevant perspectives and consider the validity and reliability of sources.

- (2.4) Deliver multimedia presentations:
- 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.
  - Select an appropriate medium for each element of the presentation.
  - Use the selected media skillfully, editing appropriately and monitoring for quality.
  - Test the audience's response and revise the presentation accordingly.
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#### 2.5 *Multimedia:*

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.

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### 3.0 Career Planning and Management

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

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, 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.
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### 4.0 Technology

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

- 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.
- 4.4 Understand how the stability of a technological system is influenced by all of the components in the system.
- 4.5 Understand manufacturing-related concepts and the applications of technological (systems) literacy and technical (craft) skill.

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## 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:

- 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.

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## 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:

- 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 for health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.
- 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.
- 6.4 Understand the safe and appropriate use of tools and equipment in the school manufacturing facility.
- 6.5 Understand important rules and responsibilities of various governmental safety agencies and their relationship to manufacturing industries.
- 6.6 Know the health and safety precautions and rules essential to a person's health and well-being.

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## 7.0 Responsibility and Flexibility

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

- 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.

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## 8.0 Ethics and Legal Responsibilities

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

- 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.
- 8.4 Practice ethical and legal behavior consistent with workplace standards.

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## 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:

- 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, such as SkillsUSA, 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.

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## 10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Manufacturing and Product Development sector:

- 10.1 Use and maintain tools, equipment, systems, and products common to the school manufacturing facility.
- 10.2 Know the processes for acquiring and storing industrial materials as well as for allocating time and space efficiently.
- 10.3 Understand that quality control is a planned process to ensure that a product, service, or system meets established criteria.
- 10.4 Understand the role of manufacturing sector industries in the California economy.
- 10.5 Complete a comprehensive working sketch and drawing of a product to be produced.

- 10.6 Apply the design process in the development, evaluation, and refinement of a manufacturing product prototype.
- 10.7 Understand how graphic arts processes produce visual images to inform, educate, and serve manufacturing and personal needs.
- 10.8 Understand how manufacturing systems and processes transform and add value to industrial materials.
- 10.9 Understand the characteristics of various nonprint media, using current technologies available to school manufacturing facilities.
- 10.10 Understand the need to participate in sector-related professional improvement activities, SkillsUSA, other career technical education leadership and skill associations, and related career pathway specializations.
- 10.11 Understand the need to obtain and maintain industry-standard, technical certifications significant to an industry sector.

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## **11.0 Demonstration and Application**

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



## PATHWAY STANDARDS

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### A. Graphic Arts Technology Pathway

The Graphic Arts Technology Pathway provides students with an understanding of manufacturing processes and systems common to careers in graphic arts and printing technology. Representative topics include the printing enterprise, art and copy preparation, graphic design, image generation and assembly, reproduction photography, graphic reproduction operations, binding and finishing related to digital imaging, lithography, and screen printing.

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*A1.0 Students understand the application of basic graphic art design principles to achieve specific goals:*

- A1.1 Produce sketches, rough layouts, and comprehensive layouts for a printed product by using design principles to guide the process.
  - A1.2 Evaluate graphic arts copies, designs, and layouts for proper grammar, punctuation, and adherence to specifications.
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*A2.0 Students understand graphic arts functions and copy preparation, including applications of desktop publishing and electronic imaging software:*

- A2.1 Know variables related to graphic art and copy preparation.
  - A2.2 Know how to produce single and multicolor images used for reproducing printed products.
  - A2.3 Know desktop publishing and electronic imaging software principles and processes used to prepare graphic arts products.
  - A2.4 Produce a printed product with the use of desktop publishing and electronic imaging software.
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*A3.0 Students understand image generation processes and procedures required to reproduce single-color and multicolor printing:*

- A3.1 Know the principles and processes used to prepare artwork for graphic art reproduction.
  - A3.2 Produce line, halftone, and special-effect images required for graphic art reproduction products.
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*A4.0 Students understand the processes and procedures involved in producing image carriers for the reproduction of single-color and multicolor products:*

- A4.1 Understand the process for creating image carriers for graphic art reproduction and printing.
- A4.2 Produce image carriers for single-color and multicolor products.

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A5.0 *Students understand the functions, processes, and procedures required for the reproduction of printed products and the factors affecting the image transfer process:*

- A5.1 Know how various processes may be used to produce multiple-imaged copies.
- A5.2 Understand the variables that affect the image transfer process.
- A5.3 Produce single-color and multicolor products with a minimum of waste.

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A6.0 *Students understand the binding and finishing processes:*

- A6.1 Know the functions and importance of binding and finishing operations in the production of printed products.
- A6.2 Bind and finish notepads, brochures, booklets, business cards, and other printed products.

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A7.0 *Students understand the screen-printing process:*

- A7.1 Know the materials and operations used in screen printing.
- A7.2 Know various applications of screen printing.
- A7.3 Print products on various substrates by using appropriate inks and procedures.

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A8.0 *Students understand contemporary photography and its applications:*

- A8.1 Understand current photographic technologies, processes, and materials used in the graphic arts.
- A8.2 Produce black-and-white and color images under natural and studio lighting conditions.

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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:*

- A9.1 Understand the health and safety precautions required in graphic communications laboratories.
- A9.2 Know the Occupational Safety and Health Administration rules and procedures for storing and using graphic arts materials and chemicals, the classification of recorded graphic arts environment fires, and fire-fighting treatments for those classifications.
- A9.3 Know the rules and responsibilities of the various governmental safety agencies that regulate and influence the graphics arts manufacturing industry.

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## B. Integrated Graphics Technology Pathway

The Integrated Graphics Technology Pathway provides students with an understanding of the manufacturing processes and systems common to careers in integrated graphics technology. Representative topics include integrated text, graphic, audio, video, and animation enterprises; composition and imaging; on-demand publishing; desktop publishing; integrated graphic design; digital imaging; color separation theory; communication techniques; electronic prepress; electronic image assembly; analog and digital video; integrated graphic media distribution; and integrated graphic media protection and storage.

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*B1.0 Students understand the application of basic integrated graphic design principles to achieve specific goals:*

- B1.1 Produce sketches, rough layouts, and comprehensive layouts for an integrated graphic product, using design principles to guide the process.
- B1.2 Evaluate integrated graphic multimedia designs and layouts for proper grammar, punctuation, and adherence to specifications.

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*B2.0 Students understand integrated graphic multimedia functions and applications of electronic imaging software:*

- B2.1 Know electronic imaging software principles and processes used to prepare integrated graphic multimedia products.
- B2.2 Produce an integrated graphic multimedia product by using electronic imaging software.

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*B3.0 Students understand contemporary photography and its applications in integrated graphic multimedia processes and systems:*

- B3.1 Understand current photographic technologies, processes, and materials used in the integrated graphic multimedia industry.
- B3.2 Produce black-and-white and color images under natural and studio lighting conditions.

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*B4.0 Students understand contemporary video production:*

- B4.1 Know current video technologies, processes, and procedures used in producing videos.
- B4.2 Understand the process for producing a comprehensive script and storyboard.

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*B5.0 Students understand integrated graphic multimedia technologies:*

- B5.1 Understand current integrated graphic multimedia technologies, characteristics, processes, procedures, and systems.
- B5.2 Know the steps in producing an integrated graphic multimedia project designed to inform, teach, or sell.
- B5.3 Know strategies for disseminating integrated graphic multimedia projects.
- B5.4 Know strategies for distributing an integrated graphic multimedia project using one or more media.

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## C. Machine and Forming Technology Pathway

The Machine and Forming Technology Pathway provides students with an understanding of manufacturing processes and systems common to careers in machine tool and materials forming industries. Representative topics include the interpretation and layout of machined and formed-part prints; the cutting, shaping, fastening, and finishing of machine tools; and casting, forging, molding, cold forming, and shearing processes.

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*C1.0 Students understand the planning and layout operations used in machine tool and materials forming processes:*

- 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.
- C1.2 Understand the design parameters across machine tool and materials-forming organizational levels.
- C1.3 Use current information technology ideation and design process systems in the manufacturing of machined and formed parts and products.

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*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:*

- C2.1 Understand the qualities of various raw and industrial materials and how these qualities affect the ability of the materials to be processed in the manufacturing of machined and formed parts and products.
- 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 for Metalworking Skills, the Manufacturing Skill Standards Council, or similar standards.

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*C3.0 Students understand various types of machine and forming assembly processes, such as flow, pressure, cold, and adhesive bonding, and mechanical fasteners:*

- C3.1 Use various methods for the assembly of machined and formed parts and products in manufacturing, such as thread cutting and bonding agents.
- C3.2 Select and use the tools, such as taps and dies, wrenches, and spot welders, and the assembly process appropriate to the design criteria of a specific machined and formed product.

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C4.0 *Students understand finishing processes and the differences between various types of finishing materials used in the manufacturing of machined and formed parts and products:*

- C4.1 Understand and use processes such as pickling, dipping, plating, spraying, and flow coating to finish machined and formed materials.
- C4.2 Select and use appropriate machined- and formed-part finishing processes, such as coating, plating, and anodizing, to meet specific product design criteria.

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C5.0 *Students understand the purposes and processes of inspection and quality control in machining and forming manufacturing processes:*

- C5.1 Know the reasons for inspection and quality control in the manufacture of machined and formed parts.
- C5.2 Know how to perform a continuous online quality control inspection of machined and formed parts.
- C5.3 Know how to troubleshoot performance problems of machining and forming systems.

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C6.0 *Students understand various machining and forming manufacturing systems that require standard hand and machine tools:*

- C6.1 Understand the characteristics of various machining and forming systems used in conventional manufacturing industries, such as open dies, smith forging, blow molding, stamping, drawing, shearing, chip removal, milling, turning, and electrical discharge systems.
- C6.2 Select and use appropriate machining and forming tools, equipment, and inspection devices to manufacture parts or products.

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C7.0 *Students understand various machining and forming automated manufacturing systems, tool design, design for manufacturing, flexible manufacturing systems, and materials resource planning:*

- C7.1 Understand materials and processes in relation to machining and forming manufacturing systems.
- C7.2 Understand the processes involved in the following machining and forming manufacturing systems: “just in time,” tool design, design for manufacturing, flexible manufacturing systems, and materials resource planning.
- C7.3 Use computers to design and produce machined and formed products, write numerical control programs, and control robots.

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C8.0 *Students understand the development of emerging machining and forming technology systems:*

- C8.1 Manufacture parts or products from industrial materials by using machining and forming systems, such as electrical discharge, laser cutting, chemical machining, and chemical bonding processes.
- C8.2 Understand the importance of maintaining documentation for machining and forming systems.

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C9.0 *Students understand the operation and functions of machine tools in production and prototype work:*

- C9.1 Use various machine tools, such as lathes, mills, drills, and saws, to produce parts and products.
- C9.2 Select appropriate machining processes and equipment to produce prototypes or production parts or products.

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C10.0 *Students understand industrial forming processes and their application to specific types of materials:*

- C10.1 Use various forming tools and equipment, such as rolls, brakes, dies, and presses, to manufacture parts and products.
- C10.2 Select appropriate tools, processes, and equipment to successfully produce formed parts or products.

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C11.0 *Students understand how a manufacturing company is organized and the elements of a machining and forming production management system:*

- C11.1 Understand corporate structures that affect machining and forming production.
- C11.2 Understand that a machining and forming production management system includes planning, engineering, organizing, and controlling resources and manufacturing processes.
- C11.3 Know how scheduling, quality control, accident prevention, and inventory control are used efficiently and appropriately in a machining and forming production management system.

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## D. Welding Technology Pathway

The Welding Technology Pathway provides students with an understanding of manufacturing processes and systems common to careers in welding and related industries. Representative topics include the interpretation and layout of welded and assembled-part prints, mechanical bonding, joining, cohesive bonding, adhesive bonding, and mechanical fastening.

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*D1.0 Students understand the planning and layout operations used in welding processes:*

- 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.
- D1.2 Understand the design parameters across welding-process organizational levels.
- D1.3 Use current information technology ideation and design process systems in the manufacturing of welded parts and products.

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*D2.0 Students understand how materials can be processed through the use of welding tools and equipment:*

- D2.1 Understand the qualities of various raw and industrial materials and how these qualities affect the ability of the materials to be processed to produce useful and value-added welded parts and products.
- D2.2 Use welding tools and equipment, such as MIG, TIG, arc, forge and furnace, to combine or join manufactured parts and products, resulting in a finished product that meets the standards of the American Welding Society or a similar industry.

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*D3.0 Students understand various types of welding assembly processes:*

- D3.1 Bond industrial materials by using adhesive and cohesive processes, such as flow, pressure, cold, and fusion bonding.
- D3.2 Understand the processes used for finishing welded materials.
- D3.3 Use welding tools, such as MIG, TIG, arc, forge, and furnace, and the equipment and assembly processes appropriate to the design criteria of a specific product to result in a finished product that meets the standards of the American Welding Society or similar welding standards.

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*D4.0 Students understand finishing processes and the differences between various types of finishing materials used in the manufacture of welded parts and products:*

- D4.1 Know the steps to be taken and the choices to be made in finishing welded materials.
- D4.2 Understand how to select an appropriate finishing process to meet the design criteria of a specific welded product.

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*D5.0 Students understand the purposes and processes of inspection and quality control in welding manufacturing processes:*

- D5.1 Know the reasons for inspection and quality control in the manufacturing of welded parts.
- D5.2 Perform continuous online quality control inspections of welded parts.
- D5.3 Know how to troubleshoot performance problems of welding systems.

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*D6.0 Students understand various welding systems that require standard hand and machine tools:*

- D6.1 Understand the various welding systems used in conventional manufacturing industries in order to select and use appropriate tools, equipment, and inspection devices.
- D6.2 Select and use appropriate welding tools, equipment, and inspection devices to manufacture parts or products.

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*D7.0 Students understand various automated welding systems, welding design for manufacturing, flexible manufacturing systems, and materials resource planning:*

- D7.1 Understand materials and processes in relation to welding systems.
- D7.2 Understand welding processes involved in the following manufacturing systems: “just in time,” design for manufacturing, flexible manufacturing systems, and materials resource planning.
- D7.3 Use computers to design and produce welded products, write numerical control programs, and control robots.
- D7.4 Understand the ways in which emerging welding systems may be integrated into current manufacturing processes.
- D7.5 Understand the importance of maintaining documentation for welding systems.

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*D8.0 Students understand various joining or combining processes, including welding processes used in manufacturing, maintenance, and repair:*

- D8.1 Know various welding processes used to complete a fabrication, an assembly, or a repair.
- D8.2 Complete a fabrication, an assembly, or a repair by using appropriate techniques and processes.

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*D9.0 Students understand how a manufacturing company is organized and the elements of welding production management:*

- D9.1 Understand corporate structures that affect welding production.
- D9.2 Understand that a welding production management system includes planning, engineering, organizing, and controlling resources and manufacturing processes.
- D9.3 Know how scheduling, quality control, accident prevention, and inventory control are used efficiently and appropriately in a welding production management system.



The background of the slide features a large, light gray watermark of the Seal of the State Board of Education of Alaska. The seal is circular and contains the text "BOARD OF EDUCATION" at the top and "ALASKA" at the bottom. The central figure is a Native Alaskan woman in traditional dress, holding a spear. Below her is a bear, and to the left is a scene with a boat and a person. The seal is surrounded by a rope-like border and several stars.

## **Marketing, Sales, and Service Industry Sector**

### *Career Pathways*

- ◆ E-commerce
- ◆ Entrepreneurship
- ◆ International Trade
- ◆ Professional Sales  
and Marketing



# Marketing, Sales, and Service Industry Sector

The Marketing, Sales, and Service sector is designed to align career path course work with current and projected employment opportunities. Marketing includes the processes and techniques of transferring products or services to consumers and is a function of almost every business. It exists within an environment of rapidly changing technology, interdependent nations and economies, and increasing demands for ethical and social responsibility.

The four pathways in this sector—E-commerce, Entrepreneurship, International Trade, and Professional Sales and Marketing—emphasize training to meet the growing need for marketing professionals with skills in communication, global marketing, marketing strategies, product and service management, promotion, and selling concepts. These pathways provide a firm foundation for advanced education, entry to a career, and success in the global marketplace.

## FOUNDATION STANDARDS

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### 1.0 Academics

Students understand the academic content required for entry into postsecondary education and employment in the Marketing, Sales, and Service sector.

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, and history–social science content standards adopted by the State Board of Education.)*

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#### 1.1 Mathematics

Specific applications of Number Sense standards (grade seven):

- (1.1) Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.
- (1.2) Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

- (1.3) Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
- (1.4) Differentiate between rational and irrational numbers.
- (1.5) Know that every rational number is either a terminating or a repeating decimal and be able to convert terminating decimals into reduced fractions.
- (1.6) Calculate the percentage of increases and decreases of a quantity.
- (1.7) Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

Specific applications of Statistics, Data Analysis, and Probability standards (grade seven):

- (1.1) Know various forms of display for data sets, including a stem-and-leaf plot or box-and-whisker plot; use the forms to display a single set of data or to compare two sets of data.
- (1.2) Represent two numerical variables on a scatterplot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level).
- (3.3) Understand the meaning of, and be able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.

Specific applications of Mathematical Reasoning standards (grade seven):

- (1.1) Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
- (2.1) Use estimation to verify the reasonableness of calculated results.
- (2.2) Apply strategies and results from simpler problems to more complex problems.
- (2.3) Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- (2.4) Make and test conjectures by using both inductive and deductive reasoning.
- (2.5) Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- (2.6) Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- (2.7) Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- (2.8) Make precise calculations and check the validity of the results from the context of the problem.
- (3.1) Evaluate the reasonableness of the solution in the context of the original situation.
- (3.2) Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- (3.3) Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.

Specific applications of Algebra I standards (grades eight through twelve):

- (1.1) Students use properties of numbers to demonstrate whether assertions are true or false.
- (5.0) Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
- (13.0) Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.
- (15.0) Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.
- (24.1) Students explain the difference between inductive and deductive reasoning and identify and provide examples of each.
- (24.2) Students identify the hypothesis and conclusion in logical deduction.
- (24.3) Students use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.
- (25.1) Students use properties of numbers to construct simple, valid arguments (direct and indirect) for, or formulate counterexamples to, claimed assertions.
- (25.2) Students judge the validity of an argument according to whether the properties of the real number system and the order of operations have been applied correctly at each step.
- (25.3) Given a specific algebraic statement involving linear, quadratic, or absolute value expressions or equations or inequalities, students determine whether the statement is true sometimes, always, or never.

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### 1.2 Science

Specific applications of Investigation and Experimentation standards (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.
- (1.d) Formulate explanations by using logic and evidence.

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### 1.3 History–Social Science

Specific applications of World History, Culture, and Geography: The Modern World standards (grade ten):

- (10.3.) Students analyze the effects of the Industrial Revolution in England, France, Germany, Japan, and the United States.
  - (10.3.1) Analyze why England was the first country to industrialize.
  - (10.3.2) Examine how scientific and technological changes and new forms of energy brought about massive social, economic, and cultural change (e.g., the inventions and discoveries of James Watt, Eli Whitney, Henry Bessemer, Louis Pasteur, Thomas Edison).

- (10.3.3) Describe the growth of population, rural to urban migration, and growth of cities associated with the Industrial Revolution.
- (10.3.4) Trace the evolution of work and labor, including the demise of the slave trade and the effects of immigration, mining and manufacturing, division of labor, and the union movement.
- (10.3.5) Understand the connections among natural resources, entrepreneurship, labor, and capital in an industrial economy.
- (10.3.6) Analyze the emergence of capitalism as a dominant economic pattern and the responses to it, including Utopianism, Social Democracy, Socialism, and Communism.

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (11.11) Students analyze the major social problems and domestic policy issues in contemporary American society.
  - (11.11.1) Discuss the reasons for the nation's changing immigration policy, with emphasis on how the Immigration Act of 1965 and successor acts have transformed American society.
  - (11.11.2) Discuss the significant domestic policy speeches of Truman, Eisenhower, Kennedy, Johnson, Nixon, Carter, Reagan, Bush, and Clinton (e.g., with regard to education, civil rights, economic policy, environmental policy).
  - (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.
  - (11.11.4) Explain the constitutional crisis originating from the Watergate scandal.
  - (11.11.5) Trace the impact of, need for, and controversies associated with environmental conservation, expansion of the national park system, and the development of environmental protection laws, with particular attention to the interaction between environmental protection advocates and property rights advocates.
  - (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.
  - (11.11.7) Explain how the federal, state, and local governments have responded to demographic and social changes such as population shifts to the suburbs, racial concentrations in the cities, Frostbelt-to-Sunbelt migration, international migration, decline of family farms, increases in out-of-wedlock births, and drug abuse.

Specific applications of Principles of Economics standards (grade twelve):

- (12.1) Students understand common economic terms and concepts and economic reasoning.
  - (12.1.1) Examine the causal relationship between scarcity and the need for choices.
  - (12.1.2) Explain opportunity cost and marginal benefit and marginal cost.
  - (12.1.3) Identify the difference between monetary and nonmonetary incentives and how changes in incentives cause changes in behavior.
  - (12.1.4) Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.

- (12.1.5) Analyze the role of a market economy in establishing and preserving political and personal liberty (e.g., through the works of Adam Smith).
- (12.2) Students analyze the elements of America's market economy in a global setting.
  - (12.2.1) Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.
  - (12.2.2) Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.
  - (12.2.3) Explain the roles of property rights, competition, and profit in a market economy.
  - (12.2.4) Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.
  - (12.2.5) Understand the process by which competition among buyers and sellers determines a market price.
  - (12.2.6) Describe the effect of price controls on buyers and sellers.
  - (12.2.7) Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.
  - (12.2.8) Explain the role of profit as the incentive to entrepreneurs in a market economy.
  - (12.2.9) Describe the functions of the financial markets.
  - (12.2.10) Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.
- (12.3) Students analyze the influence of the federal government on the American economy.
  - (12.3.1) Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.
  - (12.3.2) Identify the factors that may cause the costs of government actions to outweigh the benefits.
  - (12.3.3) Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.
  - (12.3.4) Understand the aims and tools of monetary policy and their influence on economic activity (e.g., the Federal Reserve).
- (12.4) Students analyze the elements of the U.S. labor market in a global setting.
  - (12.4.1) 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.
  - (12.4.2) Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.

- (12.4.3) Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.
- (12.4.4) Explain the effects of international mobility of capital and labor on the U.S. economy.
- (12.5) Students analyze the aggregate economic behavior of the U.S. economy.
  - (12.5.1) Distinguish between nominal and real data.
  - (12.5.2) Define, calculate, and explain the significance of an unemployment rate, the number of new jobs created monthly, an inflation or deflation rate, and a rate of economic growth.
  - (12.5.3) Distinguish between short-term and long-term interest rates and explain their relative significance.
- (12.6) Students analyze issues of international trade and explain how the U.S. economy affects, and is affected by, economic forces beyond the United States borders.
  - (12.6.1) Identify the gains in consumption and production efficiency from trade, with emphasis on the main products and changing geographic patterns of twentieth-century trade among countries in the Western Hemisphere.
  - (12.6.2) Compare the reasons for and the effects of trade restrictions during the Great Depression compared with present-day arguments among labor, business, and political leaders over the effects of free trade on the economic and social interests of various groups of Americans.
  - (12.6.3) Understand the changing role of international political borders and territorial sovereignty in a global economy.
  - (12.6.4) Explain foreign exchange, the manner in which exchange rates are determined, and the effects of the dollar's gaining (or losing) value relative to other currencies.

## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English–language arts content standards adopted by the State Board of Education.)*

### 2.1 Reading

Specific applications of Reading Comprehension standards (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.
- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (2.3) Generate relevant questions about readings on issues that can be researched.

- (2.4) Synthesize the content from several sources or works by a single author dealing with a single issue; paraphrase the ideas and connect them to other sources and related topics to demonstrate comprehension.
- (2.5) Extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration.
- (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).
- (2.7) Critique the logic of functional documents by examining the sequence of information and procedures in anticipation of possible reader misunderstandings.

Specific applications of Reading Comprehension standards (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.

## 2.2 Writing

Specific applications of Writing Strategies and Applications standards (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.
- (1.4) Develop the main ideas within the body of the composition through supporting evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions).
- (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).
- (1.6) Integrate quotations and citations into a written text while maintaining the flow of ideas.
- (1.7) Use appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals (e.g., *Modern Language Association Handbook*, *The Chicago Manual of Style*).
- (1.8) Design and publish documents by using advanced publishing software and graphic programs.
- (1.9) Revise writing to improve the logic and coherence of the organization and controlling perspective, the precision of word choice, and the tone by taking into consideration the audience, purpose, and formality of the context.
- (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.
- (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.
- (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.
- (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.

Specific applications of Writing Strategies and Applications standards (grades eleven and twelve):

- (1.1) Demonstrate an understanding of the elements of discourse (e.g., purpose, speaker, audience, form) when completing narrative, expository, persuasive, or descriptive writing assignments.
- (1.3) Structure ideas and arguments in a sustained, persuasive, and sophisticated way and support them with precise and relevant examples.
- (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).
- (1.7) Use systematic strategies to organize and record information (e.g., anecdotal scripting, annotated bibliographies).
- (1.8) Integrate databases, graphics, and spreadsheets into word-processed documents.

- (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.
- (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.

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### 2.3 *Written and Oral English Language Conventions*

Specific applications of English Language Conventions standards (grades nine and ten):

- (1.1) Identify and correctly use clauses (e.g., main and subordinate), phrases (e.g., gerund, infinitive, and participial), and mechanics of punctuation (e.g., semicolons, colons, ellipses, hyphens).
- (1.2) Understand sentence construction (e.g., parallel structure, subordination, proper placement of modifiers) and proper English usage (e.g., consistency of verb tenses).
- (1.3) Demonstrate an understanding of proper English usage and control of grammar, paragraph and sentence structure, diction, and syntax.
- (1.4) Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
- (1.5) Reflect appropriate manuscript requirements, including title page presentation, pagination, spacing and margins, and integration of source and support material (e.g., in-text citation, use of direct quotations, paraphrasing) with appropriate citations.

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### 2.4 *Listening and Speaking*

Specific applications of Listening and Speaking Strategies and Applications standards (grades nine and ten):

- (1.1) Formulate judgments about the ideas under discussion and support those judgments with convincing evidence.
- (1.2) Compare and contrast the ways in which media genres (e.g., televised news, news magazines, documentaries, online information) cover the same event.

- (1.3) Choose logical patterns of organization (e.g., chronological, topical, cause and effect) to inform and to persuade, by soliciting agreement or action, or to unite audiences behind a common belief or cause.
- (1.7) Use props, visual aids, graphs, and electronic media to enhance the appeal and accuracy of presentations.
- (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.
- (2.4) Deliver oral responses to literature:
  - a. Advance a judgment demonstrating a comprehensive grasp of the significant ideas of works or passages (i.e., make and support warranted assertions about the text).
  - b. Support important ideas and viewpoints through accurate and detailed references to the text or to other works.
  - c. Demonstrate awareness of the author's use of stylistic devices and an appreciation of the effects created.
  - d. Identify and assess the impact of perceived ambiguities, nuances, and complexities within the text.
- (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.
- (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.

Specific applications of Speaking Applications standards (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.
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- 2.5 Understand written business communication modes, such as memos, e-mail messages, and one-page executive summaries.
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### **3.0 Career Planning and Management**

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

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, 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.
  - 3.7 Explore career opportunities in business through programs such as virtual enterprise, work experience, and internships.
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### **4.0 Technology**

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

- 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.

- 4.4 Understand effective technologies used in Web site development and the Internet.
- 4.5 Know the procedures for maintaining secure information, preventing loss, and reducing risk.

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## 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:

- 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 evaluation components.
- 5.3 Use critical thinking skills to make informed decisions and solve problems.
- 5.4 Understand how financial systems and tools are used to solve business problems.

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## 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:

- 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 for health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.3 Understand the environmental and ergonomic risks associated with the use of business equipment and the financial impact related to an unsafe work environment.

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## 7.0 Responsibility and Flexibility

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

- 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.

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## 8.0 Ethics and Legal Responsibilities

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

- 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.
- 8.4 Understand the major local, state, and federal laws and regulations that affect business and the procedural requirements necessary for compliance.
- 8.5 Know how to design systems and applications to allow access to all users, including those with cultural, physical, and cognitive differences.

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## 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:

- 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, such as DECA (An Association of Marketing Students) and Future Business Leaders of America, 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.

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## 10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Marketing, Sales, and Service sector:

- 10.1 Use the marketing information management concepts, systems, and tools needed to obtain, evaluate, and disseminate information for use in making marketing decisions.
- 10.2 Understand the financial concepts used in making marketing decisions.
- 10.3 Know the product and service management concepts and processes needed to obtain, develop, maintain, and improve a product or service mix in response to market opportunities.

- 10.4 Know how promotion concepts and strategies, including advertising, sales promotion, public relations, and personal selling, are used to communicate information about products, services, images, and ideas to achieve a desired outcome.
- 10.5 Understand the methods used to determine client needs and desires and respond with selling concepts, including planned, personalized communication that influences purchase decisions and enhances future business opportunities.
- 10.6 Understand the distribution concepts and processes needed to move, store, locate, and transfer ownership of goods or services.
- 10.7 Know the pricing concepts and strategies used to maximize return and meet customers' perceptions of value.

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## **11.0 Demonstration and Application**

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

## PATHWAY STANDARDS

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### A. E-commerce Pathway

The Internet is increasingly the element that holds the global economy together as it makes the marketplace an all-day, everyday event. Globalization is no longer an option but a strategic necessity for all but the smallest of corporations. Students pursuing the E-commerce Pathway develop an understanding of the functions, foundations, and dynamics of e-commerce as well as the legal, ethical, and social responsibilities of the business.

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*A1.0 Students understand the fundamental concepts of e-commerce:*

- A1.1 Explain how e-commerce is similar to and different from traditional commerce, including comparing the competitive environment of online models with traditional business models.
  - A1.2 Understand the economic impact of the partnership between the Internet and business.
  - A1.3 Understand the role of the Internet in expanding business options and creating diverse marketplace opportunities.
  - A1.4 Analyze information gained through e-market research to make decisions about marketing goods and services online.
  - A1.5 Identify common e-market research activities and the type of information each provides.
  - A1.6 Know appropriate methods of product or service delivery in an e-commerce environment.
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*A2.0 Students understand the decisions an e-commerce business makes in the development of products and services:*

- A2.1 Understand how e-commerce has affected traditional branding strategies.
  - A2.2 Know how an e-commerce Web site must label products to meet legal and ethical business requirements.
  - A2.3 Understand the importance of an appropriate and attractive presentation of goods and services sold electronically.
  - A2.4 Know the techniques used by marketers in an online environment to position products and services.
  - A2.5 Know the procedures involved in product planning for an online business.
- 

*A3.0 Students understand important promotional strategies for communicating information about products, services, images, and ideas in an e-commerce environment:*

- A3.1 Understand the benefits of online communication channels, such as chat rooms, news groups, list servs, and message boards, as they pertain to online advertising.



- A3.2 Understand the function of Internet hyperlinks and the potential usefulness to e-business marketing strategies.
- A3.3 Know the essential components of an effective e-commerce Web site.
- A3.4 Know public relations strategies and techniques for online businesses.
- A3.5 Know how to use keywords and register Web sites to make them easily accessible through online searches.

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*A4.0 Students understand the purpose, process, and components of effective online sales and purchasing:*

- A4.1 Understand what motivates consumers to buy online.
- 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.
- A4.3 Know various payment options for online purchases and their relative advantages and disadvantages for consumers and businesses.
- A4.4 Understand the methods used to provide Internet customers with product and service knowledge.
- A4.5 Know the main components of relationship marketing in an e-commerce environment.

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*A5.0 Students understand the role of technology as it relates to e-commerce:*

- A5.1 Understand the role of e-mail in an e-commerce environment.
- A5.2 Know the important components of Web hosting packages and how they fit various business needs.
- A5.3 Analyze the effectiveness of various methods available for making online purchases and payments.
- A5.4 Know common security measures used to protect businesses and consumers engaging in e-commerce.
- A5.5 Know how various tools used in e-commerce (e.g., Web authoring programs, database solutions) contribute to Web site effectiveness.

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## B. Entrepreneurship Pathway

Competition and the global economy have opened the door for many new businesses, and entrepreneurs are becoming increasingly vital to the economy. Students with a career interest in entrepreneurship learn skills for employment in today's growth industries as well as skills that are transferable to careers of the future.

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*B1.0 Students understand the basic aspects of entrepreneurship:*

- B1.1 Analyze the characteristics of successful entrepreneurs.
  - B1.2 Understand the different types of business ownership and the advantages and disadvantages of owning and managing a small business.
  - B1.3 Apply principles and procedures of accounting and finance to the operation of a small business.
  - B1.4 Know the risk management principles associated with small business ownership.
  - B1.5 Formulate pricing strategies for goods and services for a small business.
  - B1.6 Know how the various channels of distribution and inventory control systems are important to the marketing process of a small business.
  - B1.7 Know the elements of effective human resources management and how these practices benefit small businesses.
- 

*B2.0 Students understand the elements and purpose of a business plan:*

- B2.1 Understand the reasons a small business develops a business plan.
  - B2.2 Conduct market research by using a variety of methods.
  - B2.3 Analyze market research to develop a marketing plan.
  - B2.4 Develop a financial plan that outlines sources of capital and projects income and expenses.
  - B2.5 Analyze a proposed business situation and its potential market.
- 

*B3.0 Students understand how to use technology in a small business to gain a competitive advantage:*

- B3.1 Know how technology and electronic media can be used to manage work flow and provide feedback for operational efficiency.
- B3.2 Know important technologies affecting small businesses and how they impact operations.
- B3.3 Understand the software technologies used to make a Web site effective for small business needs.

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*B4.0 Students understand effective marketing of small businesses:*

- B4.1 Know the selling techniques used to aid customers and clients in making buying decisions.
- B4.2 Know the components of a promotional plan (e.g., advertising, public relations, sales promotion) and how the plan is used to achieve a stated outcome.
- B4.3 Understand how products and services are conceived, developed, maintained, and improved in response to market opportunities.
- B4.4 Understand how market research is used to develop strategies for marketing products or services in a small business.

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*B5.0 Students understand the key economic concepts that affect small business ownership:*

- B5.1 Understand the role and importance of entrepreneurship and the small business in the economy.
- B5.2 Understand common ways in which fiscal and monetary policies affect the economy (e.g., the availability of money and credit and business decisions).
- B5.3 Understand the role of government in the free enterprise system and its impact on small businesses.
- B5.4 Understand the relationship between supply and demand and pricing and production.
- B5.5 Know how scarcity and allocation affect small businesses.
- B5.6 Understand the importance of economic measurement and the factors used to calculate it.

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## C. International Trade Pathway

The relative ease of travel and the use of electronic communication have seemingly diminished the size of the globe. Today's global marketplace, while growing and thriving, is also becoming increasingly competitive. Students focusing on the occupational area of international trade develop an understanding of the global business environment and the interconnectedness of cultural, political, legal, historical, economic, and ethical systems.

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*C1.0 Students understand the fundamental concepts of international business:*

- C1.1 Know the measures used to evaluate the economic conditions of a country and how economic development levels are determined.
  - C1.2 Know the risks associated with various methods of entering the global marketplace.
  - C1.3 Understand how trade agreements and barriers affect free trade.
  - C1.4 Know how the technology base of various countries affects trade
  - C1.5 Know common financing sources and the payment methods used for international business transactions.
  - C1.6 Understand the effect of imports and exports on production and manufacturing.
- 

*C2.0 Students understand how geographic, cultural, political, legal, historical, and economic factors influence international trade:*

- C2.1 Understand the ways in which cultural factors affect the marketing of goods and services.
  - C2.2 Understand international variations in business ethics and customs.
  - C2.3 Analyze how international business is affected by climate, distance, time zones, and topography.
  - C2.4 Understand the impact of organized labor on international business.
  - C2.5 Understand the ways in which a country's natural, financial, and human resources influence international business.
  - C2.6 Analyze factors that affect currency and exchange rates.
  - C2.7 Know how laws and regulations influence international trade.
- 

*C3.0 Students understand the role of information technology in modern global trade:*

- C3.1 Understand how technology is used to buy and sell products and services online.
- C3.2 Know various methods used to promote a product or service online in the global marketplace.
- C3.3 Use technology to research international trade opportunities.
- C3.4 Analyze security measures used to protect businesses and consumers engaging in international e-commerce.

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- C4.0 *Students understand the logistics of importing and exporting products and services:*
- C4.1 Explain direct and indirect distribution channels by identifying various distribution intermediaries and discussing their functions in international trade.
  - C4.2 Explain how products are prepared for international distribution, including packing and documentation.
  - C4.3 Know the most appropriate methods of transporting various products internationally.

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## D. Professional Sales and Marketing Pathway

Employees in professional sales and marketing are involved in the transfer of goods and services in the economy, both to businesses and to individual consumers. Sales positions in all sectors account for more than eight million jobs and are expected to grow. The increased use of technology in sales positions has resulted in increased responsibilities for members of the sales staff. Students focusing on this competitive career path develop an understanding of the sales process, sales management, and marketing information management.

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*D1.0 Students understand the key concepts of professional sales and marketing:*

- D1.1 Know the characteristics of a successful salesperson.
  - D1.2 Understand how various types of selling are applied in wholesale and retail environments.
  - D1.3 Know the steps of the selling process.
  - D1.4 Know the techniques used by salespeople to enhance selling potential and increase customer satisfaction.
  - D1.5 Understand the impact of a salesperson's knowledge of the product and its effect on potential sales.
  - D1.6 Understand buying motives and the customer's decision-making process.
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*D2.0 Students understand the theories and basic functions of sales management:*

- D2.1 Understand the utility of strategic planning (including setting goals and planning activities) in guiding a sales force.
  - D2.2 Know methods of motivating and evaluating sales staff.
  - D2.3 Know various approaches for organizing and leading a sales force to maximize effectiveness.
  - D2.4 Understand the importance of tracking sales figures and preparing sales reports to guide sales force activities.
- 

*D3.0 Students understand how to access and use marketing information to enhance sales opportunities and activities:*

- D3.1 Analyze and use data for identifying potential customers and clients.
- D3.2 Track trends and analyze data to forecast sales, predict economic conditions, and guide business activities.
- D3.3 Research consumers' needs and wants to develop, maintain, and improve a product or service.
- D3.4 Use sales information to guide business activities.

The background of the page features a large, light gray watermark of the Seal of the Board of Education of the State of Alaska. The seal is circular and contains the text "BOARD OF EDUCATION" at the top and "STATE OF ALASKA" at the bottom, separated by a rope-like border. The central figure is a woman in a helmet holding a spear, with a bear and other symbols below her.

## **Public Services Industry Sector**

### *Career Pathways*

- ◆ Human Services
- ◆ Legal and Government Services
- ◆ Protective Services



# Public Services Industry Sector

The Public Services sector provides a foundation for secondary students in government, public administration, public safety, legal, and human services. Students engage in an instructional program that integrates academic and technical preparation and focuses on career awareness, career exploration, and skill preparation in the industry. The sector encompasses three career pathways: Human Services, Legal and Government Services, and Protective Services. These pathways emphasize processes, systems, and services related to serving the public's interest. The knowledge and skills are acquired within a sequential, standards-based pathway program that integrates classroom, laboratory, and project- and work-based instruction as well as internship, community classroom, work experience, and cooperative career technical education. Standards included in the Public Services sector are designed to prepare students for technical training, postsecondary education, and entry to a career.

## FOUNDATION STANDARDS

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### 1.0 Academics

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

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, and history–social science content standards adopted by the State Board of Education.)*

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#### 1.1 Mathematics

Specific applications of Algebra I standards (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.
- (15.0) Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.



- (24.1) Students explain the difference between inductive and deductive reasoning and identify and provide examples of each.
- (24.2) Students identify the hypothesis and conclusion in logical deduction.
- (24.3) Students use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.
- (25.1) Students use properties of numbers to construct simple, valid arguments (direct and indirect) for, or formulate counterexamples to, claimed assertions.
- (25.2) Students judge the validity of an argument according to whether the properties of the real number system and the order of operations have been applied correctly at each step.
- (25.3) Given a specific algebraic statement involving linear, quadratic, or absolute value expressions or equations or inequalities, students determine whether the statement is true sometimes, always, or never.

## 1.2 Science

Specific applications of Investigation and Experimentation standards (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.
- (1.c) Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.
- (1.d) Formulate explanations by using logic and evidence.
- (1.e) Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.
- (1.f) Distinguish between hypothesis and theory as scientific terms.
- (1.g) Recognize the usefulness and limitations of models and theories as scientific representations of reality.
- (1.h) Read and interpret topographic and geologic maps.
- (1.j) Recognize the issues of statistical variability and the need for controlled tests.
- (1.l) Analyze situations and solve problems that require combining and applying concepts from more than one area of science.

## 1.3 History–Social Science

Specific applications of World History, Culture, and Geography: The Modern World standards (grade ten):

- (10.1) Students relate the moral and ethical principles in ancient Greek and Roman philosophy, in Judaism, and in Christianity to the development of Western political thought.
- (10.1.1) Analyze the similarities and differences in Judeo-Christian and Greco-Roman views of law, reason and faith, and duties of the individual.

- (10.1.2) Trace the development of the Western political ideas of the rule of law and illegitimacy of tyranny, using selections from Plato's *Republic* and Aristotle's *Politics*.
- (10.1.3) Consider the influence of the U.S. Constitution on political systems in the contemporary world.

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (11.1) Students analyze the significant events in the founding of the nation and its attempts to realize the philosophy of government described in the Declaration of Independence.
  - (11.1.1) Describe the Enlightenment and the rise of democratic ideas as the context in which the nation was founded.
  - (11.1.2) Analyze the ideological origins of the American Revolution, the Founding Fathers' philosophy of divinely bestowed unalienable natural rights, the debates on the drafting and ratification of the Constitution, and the addition of the Bill of Rights.
  - (11.1.3) Understand the history of the Constitution after 1787 with emphasis on federal versus state authority and growing democratization.
  - (11.1.4) Examine the effects of the Civil War and Reconstruction and of the industrial revolution, including demographic shifts and the emergence in the late nineteenth century of the United States as a world power.
- (11.3) Students analyze the role religion played in the founding of America, its lasting moral, social, and political impacts, and issues regarding religious liberty.
  - (11.3.1) Describe the contributions of various religious groups to American civic principles and social reform movements (e.g., civil and human rights, individual responsibility and the work ethic, antimonarchy and self-rule, worker protection, family-centered communities).
  - (11.3.2) Analyze the great religious revivals and the leaders involved in them, including the First Great Awakening, the Second Great Awakening, the Civil War revivals, the Social Gospel Movement, the rise of Christian liberal theology in the nineteenth century, the impact of the Second Vatican Council, and the rise of Christian fundamentalism in current times.
  - (11.3.3) Cite incidences of religious intolerance in the United States (e.g., persecution of Mormons, anti-Catholic sentiment, anti-Semitism).
  - (11.3.4) Discuss the expanding religious pluralism in the United States and California that resulted from large-scale immigration in the twentieth century.
  - (11.3.5) Describe the principles of religious liberty found in the Establishment and Free Exercise clauses of the First Amendment, including the debate on the issue of separation of church and state.
- (11.10) Students analyze the development of federal civil rights and voting rights.

- (11.10.1) Explain how demands of African Americans helped produce a stimulus for civil rights, including President Roosevelt's ban on racial discrimination in defense industries in 1941, and how African Americans' service in World War II produced a stimulus for President Truman's decision to end segregation in the armed forces in 1948.
- (11.10.2) Examine and analyze the key events, policies, 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.
- (11.10.3) Describe the collaboration on legal strategy between African American and white civil rights lawyers to end racial segregation in higher education.
- (11.10.4) Examine the roles of civil rights advocates (e.g., A. Philip Randolph, Martin Luther King, Jr., Malcolm X, Thurgood Marshall, James Farmer, Rosa Parks), including the significance of Martin Luther King, Jr.'s "Letter from Birmingham Jail" and "I Have a Dream" speech.
- (11.10.5) Discuss the diffusion of the civil rights movement of African Americans from the churches of the rural South and the urban North, including the resistance to racial desegregation in Little Rock and Birmingham, and how the advances influenced the agendas, strategies, and effectiveness of the quests of American Indians, Asian Americans, and Hispanic Americans for civil rights and equal opportunities.
- (11.10.6) Analyze the passage and effects of civil rights and voting rights legislation (e.g., 1964 Civil Rights Act, Voting Rights Act of 1965) and the Twenty-Fourth Amendment, with an emphasis on equality of access to education and to the political process.
- (11.10.7) Analyze the women's rights movement from the era of Elizabeth Stanton and Susan Anthony and the passage of the Nineteenth Amendment to the movement launched in the 1960s, including differing perspectives on the roles of women.

Specific applications of Principles of American Democracy standards (grade twelve):

- (12.1) Students explain the fundamental principles and moral values of American democracy as expressed in the U.S. Constitution and other essential documents of American democracy.
  - (12.1.1) Analyze the influence of ancient Greek, Roman, English, and leading European political thinkers such as John Locke, Charles-Louis Montesquieu, Niccolò Machiavelli, and William Blackstone on the development of American government.
  - (12.1.2) Discuss the character of American democracy and its promise and perils as articulated by Alexis de Tocqueville.
  - (12.1.3) Explain how the U.S. Constitution reflects a balance between the classical republican concern with promotion of the public good and the classical liberal concern with protecting individual rights; and discuss how the basic premises of liberal constitutionalism and democracy are joined in the Declaration of Independence as "self-evident truths."

- (12.1.4) Explain how the Founding Fathers' realistic view of human nature led directly to the establishment of a constitutional system that limited the power of the governors and the governed as articulated in the *Federalist Papers*.
- (12.1.5) Describe the systems of separated and shared powers, the role of organized interests (*Federalist Paper Number 10*), checks and balances (*Federalist Paper Number 51*), the importance of an independent judiciary (*Federalist Paper Number 78*), enumerated powers, rule of law, federalism, and civilian control of the military.
- (12.1.6) Understand that the Bill of Rights limits the powers of the federal government and state governments.
- (12.2) Students evaluate and take and defend positions on the scope and limits of rights and obligations as democratic citizens, the relationships among them, and how they are secured.
  - (12.2.1) Discuss the meaning and importance of each of the rights guaranteed under the Bill of Rights and how each is secured (e.g., freedom of religion, speech, press, assembly, petition, privacy).
  - (12.2.2) Explain how economic rights are secured and their importance to the individual and to society (e.g., the right to acquire, use, transfer, and dispose of property; right to choose one's work; right to join or not join labor unions; copyright and patent).
  - (12.2.3) Discuss the individual's legal obligations to obey the law, serve as a juror, and pay taxes.
  - (12.2.4) Understand the obligations of civic-mindedness, including voting, being informed on civic issues, volunteering and performing public service, and serving in the military or alternative service.
  - (12.2.5) Describe the reciprocity between rights and obligations; that is, why enjoyment of one's rights entails respect for the rights of others.
  - (12.2.6) Explain how one becomes a citizen of the United States, including the process of naturalization (e.g., literacy, language, and other requirements).
- (12.3) Students evaluate and take and defend positions on what the fundamental values and principles of civil society are (i.e., the autonomous sphere of voluntary personal, social, and economic relations that are not part of government), their interdependence, and the meaning and importance of those values and principles for a free society.
  - (12.3.1) Explain how civil society provides opportunities for individuals to associate for social, cultural, religious, economic, and political purposes.
  - (12.3.2) Explain how civil society makes it possible for people, individually or in association with others, to bring their influence to bear on government in ways other than voting and elections.
  - (12.3.3) Discuss the historical role of religion and religious diversity.
  - (12.3.4) Compare the relationship of government and civil society in constitutional democracies to the relationship of government and civil society in authoritarian and totalitarian regimes.

- (12.4) Students analyze the unique roles and responsibilities of the three branches of government as established by the U.S. Constitution.
- (12.4.1) Discuss Article I of the Constitution as it relates to the legislative branch, including eligibility for office and lengths of terms of representatives and senators; election to office; the roles of the House and Senate in impeachment proceedings; the role of the vice president; the enumerated legislative powers; and the process by which a bill becomes a law.
- (12.4.2) Explain the process through which the Constitution can be amended.
- (12.4.3) Identify their current representatives in the legislative branch of the national government.
- (12.4.4) Discuss Article II of the Constitution as it relates to the executive branch, including eligibility for office and length of term, election to and removal from office, the oath of office, and the enumerated executive powers.
- (12.4.5) Discuss Article III of the Constitution as it relates to judicial power, including the length of terms of judges and the jurisdiction of the Supreme Court.
- (12.4.6) Explain the processes of selection and confirmation of Supreme Court justices.
- (12.5) Students summarize landmark U.S. Supreme Court interpretations of the Constitution and its amendments.
- (12.5.1) Understand the changing interpretations of the Bill of Rights over time, including interpretations of the basic freedoms (religion, speech, press, petition, and assembly) articulated in the First Amendment and the due process and equal-protection-of-the-law clauses of the Fourteenth Amendment.
- (12.5.2) Analyze judicial activism and judicial restraint and the effects of each policy over the decades (e.g., the Warren and Rehnquist courts).
- (12.5.3) Evaluate the effects of the Court's interpretations of the Constitution in *Marbury v. Madison*, *McCulloch v. Maryland*, and *United States v. Nixon*, with emphasis on the arguments espoused by each side in these cases.
- (12.5.4) Explain the controversies that have resulted over changing interpretations of civil rights, including those in *Plessy v. Ferguson*, *Brown v. Board of Education*, *Miranda v. Arizona*, *Regents of the University of California v. Bakke*, *Adarand Constructors, Inc. v. Peña*, and *United States v. Virginia* (VMI).
- (12.6) Students evaluate issues regarding campaigns for national, state, and local elective offices.
- (12.6.1) Analyze the origin, development, and role of political parties, noting those occasional periods in which there was only one major party or were more than two major parties.
- (12.6.2) Discuss the history of the nomination process for presidential candidates and the increasing importance of primaries in general elections.
- (12.6.3) Evaluate the roles of polls, campaign advertising, and the controversies over campaign funding.
- (12.6.4) Describe the means that citizens use to participate in the political process (e.g., voting, campaigning, lobbying, filing a legal challenge, demonstrating, petitioning, picketing, running for political office).

- (12.6.5) Discuss the features of direct democracy in numerous states (e.g., the process of referendums, recall elections).
- (12.6.6) Analyze trends in voter turnout; the causes and effects of reapportionment and redistricting, with special attention to spatial districting and the rights of minorities; and the function of the Electoral College.
- (12.7) Students analyze and compare the powers and procedures of the national, state, tribal, and local governments.
  - (12.7.1) Explain how conflicts between levels of government and branches of government are resolved.
  - (12.7.2) Identify the major responsibilities and sources of revenue for state and local governments.
  - (12.7.3) Discuss reserved powers and concurrent powers of state governments.
  - (12.7.4) Discuss the Ninth and Tenth Amendments and interpretations of the extent of the federal government's power.
  - (12.7.5) Explain how public policy is formed, including the setting of the public agenda and implementation of it through regulations and executive orders.
  - (12.7.6) Compare the processes of lawmaking at each of the three levels of government, including the role of lobbying and the media.
  - (12.7.7) Identify the organization and jurisdiction of federal, state, and local (e.g., California) courts and the interrelationships among them.
  - (12.7.8) Understand the scope of presidential power and decision making through examination of case studies such as the Cuban Missile Crisis, passage of Great Society legislation, War Powers Act, Gulf War, and Bosnia.
- (12.8) Students evaluate and take and defend positions on the influence of the media on American political life.
  - (12.8.1) Discuss the meaning and importance of a free and responsible press.
  - (12.8.2) Describe the roles of broadcast, print, and electronic media, including the Internet, as means of communication in American politics.
  - (12.8.3) Explain how public officials use the media to communicate with the citizenry and to shape public opinion.
- (12.9) Students analyze the origins, characteristics, and development of different political systems across time, with emphasis on the quest for political democracy, its advances, and its obstacles.
  - (12.9.1) Explain how the different philosophies and structures of feudalism, mercantilism, socialism, fascism, communism, monarchies, parliamentary systems, and constitutional liberal democracies influence economic policies, social welfare policies, and human rights practices.
  - (12.9.2) Compare the various ways in which power is distributed, shared, and limited in systems of shared powers and in parliamentary systems, including the influence and role of parliamentary leaders (e.g., William Gladstone, Margaret Thatcher).
  - (12.9.3) Discuss the advantages and disadvantages of federal, confederal, and unitary systems of government.

- (12.9.4) Describe for at least two countries the consequences of conditions that gave rise to tyrannies during certain periods (e.g., Italy, Japan, Haiti, Nigeria, Cambodia).
- (12.9.5) Identify the forms of illegitimate power that twentieth-century African, Asian, and Latin American dictators used to gain and hold office and the conditions and interests that supported them.
- (12.9.6) Identify the ideologies, causes, stages, and outcomes of major Mexican, Central American, and South American revolutions in the nineteenth and twentieth centuries.
- (12.9.7) Describe the ideologies that give rise to Communism, methods of maintaining control, and the movements to overthrow such governments in Czechoslovakia, Hungary, and Poland, including the roles of individuals (e.g., Alexander Solzhenitsyn, Pope John Paul II, Lech Walesa, Vaclav Havel).
- (12.9.8) Identify the successes of relatively new democracies in Africa, Asia, and Latin America and the ideas, leaders, and general societal conditions that have launched and sustained, or failed to sustain, them.
- (12.10) Students formulate questions about and defend their analyses of tensions within our constitutional democracy and the importance of maintaining a balance between the following concepts: majority rule and individual rights; liberty and equality; state and national authority in a federal system; civil disobedience and the rule of law; freedom of the press and the right to a fair trial; the relationship of religion and government.

## 2.0 Communication

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

*(The standards listed below retain in parentheses the numbering as specified in the English-language arts content standards adopted by the State Board of Education.)*

### 2.1 Reading

Specific applications of Reading Comprehension standards (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.
- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (2.3) Generate relevant questions about readings on issues that can be researched.
- (2.7) Critique the logic of functional documents by examining the sequence of information and procedures in anticipation of possible reader misunderstandings.

Specific applications of Reading Comprehension standards (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.

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## 2.2 Writing

Specific applications of Writing Applications standards (grades nine and ten):

- (2.3) Write expository compositions, including analytical essays and research reports:
- Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives.
  - Convey information and ideas from primary and secondary sources accurately and coherently.
  - Make distinctions between the relative value and significance of specific data, facts, and ideas.
  - Include visual aids by employing appropriate technology to organize and record information on charts, maps, and graphs.
  - Anticipate and address readers' potential misunderstandings, biases, and expectations.
  - Use technical terms and notations accurately.
- (2.4) Write persuasive compositions:
- Structure ideas and arguments in a sustained and logical fashion.
  - 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).
  - Clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, and expressions of commonly accepted beliefs and logical reasoning.
  - Address readers' concerns, counterclaims, biases, and expectations.
- (2.5) Write business letters:
- Provide clear and purposeful information and address the intended audience appropriately.
  - Use appropriate vocabulary, tone, and style to take into account the nature of the relationship with, and the knowledge and interests of, the recipients.
  - Highlight central ideas or images.
  - Follow a conventional style with page formats, fonts, and spacing that contribute to the documents' readability and impact.
- (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):
- Report information and convey ideas logically and correctly.
  - Offer detailed and accurate specifications.
  - Include scenarios, definitions, and examples to aid comprehension (e.g., troubleshooting guide).
  - Anticipate readers' problems, mistakes, and misunderstandings.



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### 2.3 *Written and Oral English Language Conventions*

Specific applications of English Language Conventions standards (grades eleven and twelve):

- (1.1) Demonstrate control of grammar, diction, and paragraph and sentence structure and an understanding of English usage.
  - (1.2) Produce legible work that shows accurate spelling and correct punctuation and capitalization.
  - (1.3) Reflect appropriate manuscript requirements in writing.
- 

### 2.4 *Listening and Speaking*

Specific applications of Speaking Applications standards (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.
- (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.
- (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.

- (2.4) Deliver oral responses to literature:
  - a. Advance a judgment demonstrating a comprehensive grasp of the significant ideas of works or passages (i.e., make and support warranted assertions about the text).
  - b. Support important ideas and viewpoints through accurate and detailed references to the text or to other works.
  - c. Demonstrate awareness of the author's use of stylistic devices and an appreciation of the effects created.
  - d. Identify and assess the impact of perceived ambiguities, nuances, and complexities within the text.
- (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.
- (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.

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2.5 Know and understand the use of channels and networks as the necessary means of organizational communication.

2.6 Understand the importance of verbal and nonverbal communication in public services.

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### 3.0 Career Planning and Management

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

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, 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.

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## 4.0 Technology

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

- 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.
- 4.4 Know the various technologies available and the sources for gaining technical skills.
- 4.5 Use technologies to analyze and interpret information.

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## 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:

- 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.

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## 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:

- 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 for health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.3 Know how to identify possible hazards in a variety of work environments.
- 6.4 Know the safe and proper use and maintenance of appropriate equipment.

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## 7.0 Responsibility and Flexibility

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

- 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.

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## 8.0 Ethics and Legal Responsibilities

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

- 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.
- 8.4 Know personal and ethical behaviors that demonstrate commitment to professional ethics and legal responsibilities.
- 8.5 Know strategies and requirements for individuals and organizations to respond to unethical and illegal actions in a variety of workplace situations.

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## 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:

- 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.
- 9.6 Understand how team diversity can be leveraged to maximize team effectiveness.

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## 10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Public Services sector:

- 10.1 Apply technical knowledge and skills required to function in a career.
- 10.2 Use resource allocation and distribution to assist with planning and delivery of services.
- 10.3 Understand the interconnected components of public services pathways.
- 10.4 Understand how budget issues, technology, and legislative action can affect public services.

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## 11.0 Demonstration and Application

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

## PATHWAY STANDARDS

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### A. Human Services Pathway

The Human Services Pathway prepares high school students for work in entry-level positions in human services through classroom instruction, hands-on training, and community experience. It also prepares students for college and, eventually, a career in human services. The Human Services Pathway examines the nature of helping people by identifying and describing the skills required by human service professionals.

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*A1.0 Students understand the history of human services in America and the role of and demand for human service professionals:*

A1.1 Analyze the origin of human services in America, the types of problems addressed, and the nature of the services provided.

A1.2 Understand the different roles played by human service professionals now and throughout American history.

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*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:*

A2.1 Understand the need for such characteristics in the human service worker as flexibility, patience, tolerance, persistence, emotional control, humor, discretion and confidentiality, empathy and compassion, and self-awareness and ways in which to enhance those characteristics.

A2.2 Understand the level of crisis at which human services employees should seek professional assistance in solving the problem.

A2.3 Understand when and how to use problem-solving techniques, such as brainstorming and mediation, and understand how to link the methodology to the desired outcome.

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*A3.0 Students develop the specific, effective communication skills essential for working in the human services field:*

A3.1 Understand how to engage people in conversation by using active listening skills, empathy, compassion, and self-awareness.

A3.2 Understand the concepts of objectivity, subjectivity, collaboration, delayed gratification, and tolerance of frustration in dealing with others.

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*A4.0 Students understand various common cultures and the importance of providing culturally competent human services:*

A4.1 Understand the importance of cross-cultural sensitivity and appreciation of cultural differences in work with children, families, and communities from varying backgrounds.

A4.2 Know how to train others to be culturally sensitive when working with people from diverse backgrounds.

- A4.3 Know and appreciate cultural differences in this society, understanding the fundamental benefits of cultural diversity as well as the challenges.
- 

*A5.0 Students know the basic principles of research, gathering data, entering the data, and interpreting the results:*

- A5.1 Understand basic research methods and skills, including formulating a hypothesis and identifying important variables.
- A5.2 Know the major methodologies for conducting literature searches on the Internet.
- A5.3 Understand the fundamentals of constructing a survey to collect and analyze data, including the basic mathematics involved.
- 

*A6.0 Students understand various leadership styles and accountability in human services:*

- A6.1 Analyze various leadership styles in terms of accountability and commitment to others.
- A6.2 Understand basic leadership styles and approaches and distinguish between leadership and management.
- A6.3 Understand how leaders in the public and private sectors influence human service policy.
- A6.4 Understand how and why accountability mechanisms protect people receiving human services.
- 

*A7.0 Students understand the basic elements of administration of a human services agency, including recordkeeping and fundraising:*

- A7.1 Understand the fundamentals of funding and fundraising for a human services agency.
- A7.2 Understand the various ways in which human services agencies are funded as well as sources for and approaches to fundraising.
- A7.3 Understand the key aspects of administration, evaluation, reporting, and maintenance of records in a human services agency.

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## B. Legal and Government Services Pathway

The Legal and Government Services Pathway prepares high school students for work in entry-level positions in legal and government services through classroom instruction, hands-on training, and community experience. In addition, it prepares students for college and, eventually, a career in legal and government services. The Legal and Government Services Pathway examines the unique nature of careers in government service and the extensive legal system that affects nearly every aspect of society.

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*B1.0 Students develop and articulate reasoned, persuasive arguments in support of public policy options or positions:*

- B1.1 Know multiple ways of extracting ideas and materials from research and library resources.
  - B1.2 Use logical constructs to integrate and organize information and anticipate counterarguments.
  - B1.3 Use recognized patterns of discourse, rhetorical skills, images and figures of speech, and knowledge of situations and audiences to prepare and deliver compelling arguments regarding issues or proposals.
  - B1.4 Understand the characteristics of effective media presentations.
- 

*B2.0 Students understand methods to gain consensus for the resolution of differing opinions and positions and gain support for new policies or policy changes:*

- B2.1 Understand sources of conflict among constituents, constituent groups, and governing-body peers.
  - B2.2 Understand the importance of respect for ethical principles to encourage mutual regard.
  - B2.3 Know methods of articulating progress to various audiences to sustain support for present activities and future plans.
- 

*B3.0 Students understand how to formulate plans and policies to meet social, economic, and physical needs:*

- B3.1 Know methods for partnering with citizens, interest groups, and public officials to develop a vision and generate standards, policies, and plans to meet specific needs.
  - B3.2 Understand planning principles to make job growth, population, revenue, and other projections.
- 

*B4.0 Students understand methods to acquire, analyze, and disseminate information and interpret laws to facilitate clear and positive communication:*

- B4.1 Understand specialized investigative techniques, devices, and equipment to enhance investigation regarding compliance with laws and regulations.
- B4.2 Understand important ways in which information is collected, analyzed, organized, directed, and disseminated to realize specific objectives.



B4.3 Understand laws, legal interpretations, rules, or standards that apply to given situations in the specialty area of interest in legal and government services.

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B5.0 *Students understand how to maximize the potential of an organization to meet its vision, goals, and mission:*

B5.1 Know economic, political, and social trends likely to affect an agency or department.

B5.2 Understand the value of seeking diverse opinion from all stakeholders.

B5.3 Know the techniques and tools for facilitating the most effective use of human resources, including strategies for recruiting and hiring a diverse workforce.

B5.4 Understand the departmental budget and allocation processes to ensure that resources are applied in a manner that is consistent with the department's vision, mission, and goals.

B5.5 Understand the use of tables of organization and other administrative systems to assign tasks and responsibilities for maximum effectiveness.

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B6.0 *Students understand methods of encouraging the flow of ideas and information to keep agencies and the public informed of policy changes and ongoing operations:*

B6.1 Know methods to restate complex technical information or issues in language the general public can understand.

B6.2 Use verbal skills and presentation techniques effectively to explain, justify, or discuss public issues and handle difficult interviews.

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B7.0 *Students understand the use of analysis, planning, and fiscal services to prioritize and fund activities:*

B7.1 Understand the process for estimating costs according to standards for government accounting.

B7.2 Know multiple ways of researching possibilities for new or increased funding of programs.

B7.3 Understand how to prepare budgets and financial reports and contract for audits.

B7.4 Know the operation of accounting systems to maintain compliance with standards for government agency accounting.

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B8.0 *Students understand the application of laws and policies to protect or disclose information, as appropriate:*

B8.1 Understand the policy background and rationale for protecting or disclosing information.

B8.2 Understand the importance of a secure records environment.

B8.3 Understand the rationale for equal opportunity for public access to open records and how to allow access in various practical situations.

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*B9.0 Students understand the foundation of national and state law and the important elements of trial procedure:*

- B9.1 Know the key elements of the U.S. Constitution and the Bill of Rights; and know the basic parameters of U.S. and international military, maritime, criminal, and civil law.
- B9.2 Know the basic elements of all aspects of trial procedures.
- B9.3 Understand various historical legal defenses and prosecutions.
- B9.4 Understand the structure of California state law.
- B9.5 Use state and federal legal codes to research issues.
- B9.6 Understand the appropriate application of laws, rules, and standards and recognize actions in violation of laws, rules, and standards.

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## C. Protective Services Pathway

The Protective Services Pathway prepares high school students for work in entry-level positions in protective services through classroom instruction, hands-on training, and community experience. This pathway encompasses career opportunities in a variety of jobs in which the main focus is ensuring the general safety and well-being of the community. The careers included in this pathway primarily address public order, fire protection, and emergency medical services.

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*C1.0 Students apply cognitive, critical thinking, and problem-solving skills to formulate solutions to problems common in the protective services career fields:*

- C1.1 Understand the value of multiple approaches to problem solving.
- C1.2 Develop and maintain a constant awareness of potential problems.
- C1.3 Process information effectively to make prompt and effective decisions.
- C1.4 Use conflict-resolution and anger-management procedures to take charge of problems.
- C1.5 Analyze and evaluate ideas, proposals, and solutions to problems.
- C1.6 Apply critical thinking skills to perform in emergency response situations.

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*C2.0 Students develop team-building and leadership skills:*

- C2.1 Understand the qualities of effective leadership and how to exercise them in a group and in meetings.
- C2.2 Exercise people skills, including respect, adaptability, and interpersonal skills, to provide group leadership and promote collaboration.
- C2.3 Use team-building skills to solve problems.

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*C3.0 Students understand the safety, health, and environmental responsibilities of those in the protective services pathway:*

- C3.1 Become certified in first aid and cardiopulmonary resuscitation (CPR) in order to apply those skills as needed in emergencies.
- C3.2 Employ personal safety procedures to meet prescribed regulations.
- C3.3 Know the procedures for emergency response and the requirements for handling hazardous materials—in normal and emergency situations—to avoid health and environmental risks (e.g., blood-borne pathogens and contamination).
- C3.4 Understand the safety and health issues related to serving persons with disabilities.
- C3.5 Know the techniques for restraining individuals without violating their personal rights or jeopardizing safety.
- C3.6 Ask appropriate questions to investigate accidents and related incidents and document findings.

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C4.0 *Students access, manage, integrate, and create information by using information technology tools specific to the Protective Services Pathway:*

- C4.1 Know software applications skills to create and use spreadsheets, documents, databases, and presentations.
- C4.2 Use electronic mail, electronic communications networks, and Internet services to locate, retrieve, and distribute information.
- C4.3 Use radio equipment, computer technology, and public address/warning systems to manage emergency situations.

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C5.0 *Students understand the common objectives and mission of the protective services, which are to solve problems, save lives, and protect property:*

- C5.1 Understand the use of tables of organization and other administrative systems to assign tasks and responsibilities for maximum effectiveness.
- C5.2 Use organizational knowledge to describe how protective services operations interface with and rely on the other components of the Public Services sector and vice versa.
- C5.3 Know the response procedures to respond to emergency incidents of any scale, small to catastrophic.
- C5.4 Understand the relative advantages and disadvantages of proprietary and contract security operations.

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C6.0 *Students understand the appropriate level of nutrition, fitness, and agility required by the protective services career fields:*

- C6.1 Understand the need for physical fitness and proper nutrition.
- C6.2 Know the different physical agility assessments for protective services, and understand the skills and techniques necessary for success in agility testing.
- C6.3 Design and implement a personal plan for achieving and maintaining an acceptable level of agility and physical fitness.

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C7.0 *Students understand the use of active listening, clear reporting, and professional equipment to communicate effectively:*

- C7.1 Know the basic techniques and methods of active listening to obtain and clarify information in oral communications.
- C7.2 Understand how to use clear, concise, and legible entries from experience and observation to prepare and submit required reports.
- C7.3 Understand a variety of communications methods and equipment (e.g., telephones, radio systems, and mobile data communications equipment).

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- C8.0 *Students understand the laws, ordinances, regulations, and organizational rules that guide their respective protective services career field:*
- C8.1 Understand how federal, state, and local laws and regulations affect protective service operations.
  - C8.2 Understand the individual protection granted by the Constitution.
- 
- C9.0 *Students know the skills and equipment needed to deal with most protective service situations, from local emergencies to areawide incidents:*
- C9.1 Understand the skills required to deal effectively with emergency situations.
  - C9.2 Know the key elements of an action plan.
  - C9.3 Understand the management of crisis negotiations to promote the safety of individuals and the public.

The background of the page features a large, light gray watermark of the Seal of the Board of Education of the State of Alaska. The seal is circular and contains the text "BOARD OF EDUCATION" at the top and "STATE OF ALASKA" at the bottom. In the center, there is a figure of a woman in traditional Alaskan dress holding a spear, and a bear standing on a patch of land. The seal is surrounded by a decorative border of stars and a rope-like pattern.

# Transportation Industry Sector

## *Career Pathways*

- ◆ Aviation and Aerospace Transportation Services
- ◆ Collision Repair and Refinishing
- ◆ Vehicle Maintenance, Service, and Repair



# Transportation Industry Sector

The Transportation sector is designed to provide a foundation in transportation services for all industrial technology education students in California. The pathways emphasize real-world, occupationally relevant experiences of significant scope and depth in Aviation and Aerospace Transportation Services, Collision Repair and Refinishing, and Vehicle Maintenance, Service, and Repair. The standards are designed to integrate academic and technical preparation and focus on career awareness, career exploration, and skill preparation in the three pathways. Integral components include classroom, laboratory, hands-on contextual learning, and project- and work-based instruction as well as internship, community classroom, cooperative career technical education, and leadership development. The Transportation sector standards prepare students for continued training, postsecondary education, and entry to a career.

## FOUNDATION STANDARDS

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### 1.0 Academics

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

*(The standards listed below retain in parentheses the numbering as specified in the mathematics, science, and history–social science content standards adopted by the State Board of Education.)*

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#### 1.1 Mathematics

Specific applications of Number Sense standards (grade seven):

- (1.1) Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.
- (1.2) Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
- (1.3) Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.

- (1.4) Differentiate between rational and irrational numbers.
- (1.5) Know that every rational number is either a terminating or a repeating decimal and be able to convert terminating decimals into reduced fractions.
- (1.6) Calculate the percentage of increases and decreases of a quantity.
- (1.7) Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.

Specific applications of Algebra and Functions standards (grade seven):

- (1.1) Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A).
- (3.4) Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.

Specific applications of Measurement and Geometry standards (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).
- (2.4) Relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches or  $[1 \text{ ft}^2] = [144 \text{ in}^2]$ , 1 cubic inch is approximately 16.38 cubic centimeters or  $[1 \text{ in}^3] = [16.38 \text{ cm}^3]$ ).

Specific applications of Mathematical Reasoning standards (grade seven):

- (2.1) Use estimation to verify the reasonableness of calculated results.
- (2.2) Apply strategies and results from simpler problems to more complex problems.
- (2.3) Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
- (2.4) Make and test conjectures by using both inductive and deductive reasoning.
- (2.5) Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- (2.6) Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.
- (2.7) Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.
- (2.8) Make precise calculations and check the validity of the results from the context of the problem.
- (3.1) Evaluate the reasonableness of the solution in the context of the original situation.
- (3.2) Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- (3.3) Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.



Specific applications of Algebra I standards (grades eight through twelve):

- (1.1) Students use properties of numbers to demonstrate whether assertions are true or false.
- (5.0) Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
- (8.0) Students understand the concepts of parallel lines and perpendicular lines and how those slopes are related. Students are able to find the equation of a line perpendicular to a given line that passes through a given point.
- (12.0) Students simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.
- (24.1) Students explain the difference between inductive and deductive reasoning and identify and provide examples of each.
- (24.2) Students identify the hypothesis and conclusion in logical deduction.
- (24.3) Students use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.

Specific applications of Geometry standards (grades eight through twelve):

- (11.0) Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.

Specific applications of Algebra II standards (grades eight through twelve):

- (6.0) Students add, subtract, multiply, and divide complex numbers.
- 

## 1.2 Science

Specific applications of Physics standards (grades nine through twelve):

- (1.d) Students know that when one object exerts a force on a second object, the second object always exerts a force of equal magnitude and in the opposite direction (Newton's third law).
- (3.a) Students know heat flow and work are two forms of energy transfer between systems.
- (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.
- (5.b) Students know how to solve problems involving Ohm's law.

Specific applications of Investigation and Experimentation standards (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.
- (1.d) Formulate explanations by using logic and evidence.
- (1.1) Analyze situations and solve problems that require combining and applying concepts from more than one area of science.

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### 1.3 History–Social Science

Specific applications of United States History and Geography: Continuity and Change in the Twentieth Century standards (grade eleven):

- (5.5) Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.
  - (11.5.7) Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.
  - (11.8) Students analyze the economic boom and social transformation of post-World War II America.
  - (11.8.7) Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural technology.
  - (11.11) Students analyze the major social problems and domestic policy issues in contemporary American society.
  - (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.
- 

## 2.0 Communications

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

*(The standards listed below retain in parentheses the numbering as specified in the English–language arts content standards adopted by the State Board of Education.)*

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### 2.1 Reading

Specific applications of Reading Comprehension standards (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.
- (2.2) Prepare a bibliography of reference materials for a report using a variety of consumer, workplace, and public documents.
- (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).

Specific applications of Reading Comprehension standards (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.
- 

### 2.2 Writing

Specific applications of Writing Strategies standards (grade eight):

- (1.4) Plan and conduct multiple-step information searches by using computer networks and modems.

- (1.5) Achieve an effective balance between researched information and original ideas.
- (1.6) Revise writing for word choice; appropriate organization; consistent point of view; and transitions between paragraphs, passages, and ideas.

Specific applications of Writing Strategies and Applications standards (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.
- (1.4) Develop the main ideas within the body of the composition through supporting evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions).
- (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).
- (1.7) Use appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals (e.g., *Modern Language Association Handbook*, *The Chicago Manual of Style*).
- (1.8) Design and publish documents by using advanced publishing software and graphic programs.
- (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.

Specific applications of Writing Strategies and Applications standards (grades eleven and twelve):

- (1.7) Use systematic strategies to organize and record information (e.g., anecdotal scripting, annotated bibliographies).
- (1.8) Integrate databases, graphics, and spreadsheets into word-processed documents.
- (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.

- (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.

### 2.3 *Written and Oral English Language Conventions*

Specific applications of English Language Conventions standards (grades nine and ten):

- (1.4) Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.
- (1.5) Reflect appropriate manuscript requirements, including title page presentation, pagination, spacing and margins, and integration of source and support material (e.g., in-text citation, use of direct quotations, paraphrasing) with appropriate citations.

### 2.4 *Listening and Speaking*

Specific applications of Listening and Speaking Strategies and Applications standards (grade eight):

- (1.1) Analyze oral interpretations of literature, including language choice and delivery, and the effect of the interpretations on the listener.
- (1.2) Paraphrase a speaker's purpose and point of view and ask relevant questions concerning the speaker's content, delivery, and purpose.
- (1.3) Organize information to achieve particular purposes by matching the message, vocabulary, voice modulation, expression, and tone to the audience and purpose.
- (1.4) Prepare a speech outline based upon a chosen pattern of organization, which generally includes an introduction; transitions, previews, and summaries; a logically developed body; and an effective conclusion.
- (1.5) Use precise language, action verbs, sensory details, appropriate and colorful modifiers, and the active rather than the passive voice in ways that enliven oral presentations.
- (1.6) Use appropriate grammar, word choice, enunciation, and pace during formal presentations.
- (1.7) Use audience feedback (e.g., verbal and nonverbal cues):
  - a. Reconsider and modify the organizational structure or plan.
  - b. Rearrange words and sentences to clarify the meaning.
- (1.8) Evaluate the credibility of a speaker (e.g., hidden agendas, slanted or biased material).

- (1.9) Interpret and evaluate the various ways in which visual image makers (e.g., graphic artists, illustrators, news photographers) communicate information and affect impressions and opinions.
- (2.1) Deliver narrative presentations (e.g., biographical, autobiographical):
  - a. Relate a clear, coherent incident, event, or situation by using well-chosen details.
  - b. Reveal the significance of, and the subject's attitude about, the incident, event, or situation.
  - c. Employ narrative and descriptive strategies (e.g., relevant dialogue, specific action, physical description, background description, comparison or contrast of characters).
- (2.2) Deliver oral responses to literature:
  - a. Interpret a reading and provide insight.
  - b. Connect the students' own responses to the writer's techniques and to specific textual references.
  - c. Draw supported inferences about the effects of a literary work on its audience.
  - d. Support judgments through references to the text, other works, other authors, or personal knowledge.
- (2.3) Deliver research presentations:
  - a. Define a thesis.
  - b. Record important ideas, concepts, and direct quotations from significant information sources and paraphrase and summarize all relevant perspectives on the topic, as appropriate.
  - c. Use a variety of primary and secondary sources and distinguish the nature and value of each.
  - d. Organize and record information on charts, maps, and graphs.
- (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.
- (2.5) Recite poems (of four to six stanzas), sections of speeches, or dramatic soliloquies, using voice modulation, tone, and gestures expressively to enhance the meaning.

Specific applications of Listening and Speaking standards (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
- 

### **3.0 Career Planning and Management**

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

- 3.1 Know the personal qualifications, interests, aptitudes, knowledge, 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.
- 

### **4.0 Technology**

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

- 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.
- 4.4 Understand the role and function of tools, equipment, and machines in the latest technology.
- 4.5 Know important aspects of the current economy and labor market, including the type of goods and services produced, the type of skills workers need, the effects of rapid technological change, and the impact of international competition.

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## 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:

- 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.
- 5.4 Apply troubleshooting strategies, including failure analysis procedures, to issues as they arise.
- 5.5 Understand and demonstrate the ability to plan and solve problems in a systematic manner and apply the learned skills to real-world situations.

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## 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:

- 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 for health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.3 Use tools, equipment, and machinery safely and appropriately.
- 6.4 Know the local, state, and federal laws, and the requirements of regulatory agencies, that affect the transportation industry.

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## 7.0 Responsibility and Flexibility

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

- 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.

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## 8.0 Ethics and Legal Responsibilities

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

- 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.
- 

## 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:

- 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, such as SkillsUSA, 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.
  - 9.6 Participate as a member of a team and contribute to a group effort.
- 

## 10.0 Technical Knowledge and Skills

Students understand the essential knowledge and skills common to all pathways in the Transportation sector:

- 10.1 Understand how to use and maintain transportation technological products and systems.
  - 10.2 Understand the applications of transportation technology in relation to land, water, and air/space.
  - 10.3 Understand the resources used to transport people and goods.
  - 10.4 Understand various systems and processes related to transportation.
  - 10.5 Operate, maintain, and troubleshoot equipment.
  - 10.6 Understand how to acquire, store, and use materials and to allocate space efficiently.
  - 10.7 Understand how to select and use information and communication technologies.
  - 10.8 Understand the need to participate in sector-related professional improvement activities, SkillsUSA, other career technical education and skills associations, and professional improvement activities related to career pathway specializations.
  - 10.9 Understand the need to obtain and maintain industry-standard, technical certifications significant to an industry sector.
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## 11.0 Demonstration and Application

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



## PATHWAY STANDARDS

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### A. Aviation and Aerospace Transportation Services Pathway

The Aviation and Aerospace Transportation Services Pathway prepares students for postsecondary education and employment in the aviation and aerospace industries.

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*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:*

- A1.1 Practice fundamental, application-specific work processes, safety concepts, and required behaviors.
  - A1.2 Practice fundamental, application-specific biological health-hazard safety concepts and required behaviors.
  - A1.3 Understand the generation of waste gasses, emissions, and other environmentally destructive gasses and substances and the effect of such substances on the environment.
  - A1.4 Understand the advantages and disadvantages of aviation and aerospace transportation systems and the effects of those systems on the environment.
  - A1.5 Understand new and emerging aviation and aerospace transportation energy systems, materials resources, and technology (e.g., carbon fiber) and the related implications on the environment.
  - A1.6 Understand the elements of combustion, fire classifications, and fire-fighting equipment and techniques specific to the aviation and aerospace industries.
- 

*A2.0 Students understand the safe and appropriate use of tools and equipment common to the aviation and aerospace industries:*

- A2.1 Understand how aviation/aerospace industry tools and equipment are used to perform systems and component maintenance and repair operations.
  - A2.2 Understand current industry practices and strategies for work processes.
  - A2.3 Use appropriate tools, equipment, and machines common to aviation/aerospace components and systems.
  - A2.4 Use tools, equipment, and machines to safely measure, test, diagnose, and analyze aviation/aerospace components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic, and air/pneumatic systems).
- 

*A3.0 Students understand and apply measurement systems and the mathematical functions necessary to perform required maintenance and operation procedures:*

- A3.1 Understand industry-standard measurement scales, devices, and systems used to perform design, fabrication, diagnostic, maintenance, and repair procedures.
- A3.2 Use technical vocabulary, technical reports and manuals, electronic systems, and related technical data resources specific to components and systems in the aviation/aerospace transportation industry.

- A3.3 Understand the importance of calibration processes, systems, and techniques in using various measurements and testing devices.
- A3.4 Understand the mathematical functions associated with the production and maintenance of aircraft.
- A3.5 Understand mathematical functions at a proficiency level specified by Federal Aviation Administration Regulations, Part 147, Appendix B.

*A4.0 Students understand scientific principles in relation to chemical, mechanical, and physical functions:*

- A4.1 Understand the operating principles of internal and external combustion engines.
- A4.2 Understand the basic principles and the applications of pneumatic and hydraulic power.
- A4.3 Understand the potential application of alternative power sources.
- A4.4 Understand the basic principles of electricity, electronics and electrical power generation, and distribution as commonly applied.
- A4.5 Understand the principles of converting energy from one form to another and their applications.
- A4.6 Know the basic terms, characteristics, and concepts of physical and chemical processes.

*A5.0 Students understand and perform maintenance procedures for aviation and aerospace vehicles:*

- A5.1 Understand electrical applications, weight and balance specifications, and drawings and schematics at the proficiency level specified by Federal Aviation Administration Regulations, Part 147, Appendix B.
- A5.2 Understand fluid lines and fittings, materials and processes, ground operation and servicing, cleaning and corrosion control, and maintenance forms and records at the specified proficiency level.
- A5.3 Know the conditions under which service and maintenance are required for aviation vehicles by Federal Aviation Administration Regulations, Part 147, Appendix B.
- A5.4 Maintain and document the maintenance of aviation and aerospace vehicles in accordance with the recommendations of the manufacturer.

*A6.0 Students understand the basic business practices of their employment environment:*

- A6.1 Understand work-related systems of the aviation and aerospace industries.
- A6.2 Maintain accurate records for the pilot, tower, and so forth, as applicable.
- A6.3 Understand how guidelines, rules, regulations, and laws control aviation and aerospace industry practices and how they are overseen by local, state, federal, and international aviation agencies.
- A6.4 Understand the practices of acceptable customer relations services.
- A6.5 Understand the production and use of industry-generated documents, records, and forms as well as related management skills used in aviation and aerospace transportation industries.

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## B. Collision Repair and Refinishing Pathway

The Collision Repair and Refinishing Pathway prepares students for postsecondary education and employment in the transportation industry, including, but not limited to, body and frame straightening, estimating, painting, and refinishing.

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*B1.0 Students understand the value and necessity of practicing personal and occupational safety and the environmental effects of collision repair and refinishing practices:*

- B1.1 Understand industry environmental conservation practices and their applications.
  - B1.2 Practice the safe handling and storage of chemicals and hazardous wastes as required by the Occupational Safety and Health Administration, Air Resources Board, Air Quality Management Districts, and other regulatory agencies.
  - B1.3 Understand the generation of waste products and other environmentally destructive substances.
  - B1.4 Use appropriate materials and repair technologies.
  - B1.5 Understand the environmental implications of using new and emerging materials, resources, and technologies.
  - B1.6 Understand the safety practices applied when servicing vehicle-body electronics and other vehicle systems.
- 

*B2.0 Students understand the safe and appropriate use of tools, equipment, and work processes:*

- B2.1 Understand how certain tools and equipment are used to perform maintenance and repair operations.
  - B2.2 Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic and air/pneumatic systems).
- 

*B3.0 Students understand and apply measurement systems and the mathematical functions necessary to perform required fabrication, maintenance, and operation procedures:*

- B3.1 Understand industry-standard measurement scales, devices, and systems used to perform design, fabrication, diagnostic, maintenance, and repair procedures.
- B3.2 Use technical vocabulary, technical reports and manuals, electronic systems, and related technical data resources, as appropriate, to determine repairs and estimates.
- B3.3 Understand the different types of welding and heat processes used in repair processes and procedures.
- B3.4 Understand the mathematical functions associated with collision repair and refinishing.

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*B4.0 Students understand scientific principles in relation to chemical, mechanical, and physical functions and in relation to industry and manufacturer standards:*

- B4.1 Understand the principles of mechanical, electrical, hydraulic, and pneumatic power in relation to collision repair and refinishing.
- B4.2 Understand the physical and chemical characteristics of metals, plastics, and other materials.
- B4.3 Understand the principles of electricity and electronics.
- B4.4 Know the basic terms, characteristics, and concepts of physical and chemical processes.
- B4.5 Understand body and frame construction.
- B4.6 Understand the importance of calibration processes, systems, and techniques in using various measurement and testing devices.

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*B5.0 Students perform and document repair procedures in accordance with manufacturer recommendations and industry standards:*

- B5.1 Understand the recommended procedures and practices of various manufacturers.
- B5.2 Document repair procedures accurately, as required by the Bureau of Automotive Repair and other regulatory agencies.
- B5.3 Use reference books and materials, technical service bulletins, and other related documents to determine repairs and rate of pay.

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*B6.0 Students understand basic business practices:*

- B6.1 Understand work-related systems.
- B6.2 Know the laws and regulations applicable to the recordkeeping and handling of hazardous materials.
- B6.3 Understand the importance of and procedures for maintaining accurate records.
- B6.4 Understand the concept and application of accepted ethical business practices.
- B6.5 Understand the concept and application of acceptable customer relations services.

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*B7.0 Students understand structural and nonstructural analysis and damage repair:*

- B7.1 Understand how to perform frame inspection and repair.
- B7.2 Know applications, installations, and removal of fixed and moveable glass and hardware.
- B7.3 Know how to perform the principles of metal welding and cutting.
- B7.4 Understand and know how to prepare and analyze vehicles for repair.
- B7.5 Know how to perform outer body panel repairs, replacements, and adjustments.
- B7.6 Understand and know how to prepare vehicles for metal finishing and body filling.

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*B8.0 Students understand mechanical and electrical components in relation to industry and manufacturer standards:*

- B8.1 Understand how to perform steering and suspension analysis and repairs.
- B8.2 Know how to perform electrical repairs.
- B8.3 Know how to perform brake analysis and repairs.
- B8.4 Know how to perform heating, air conditioning, and cooling system repairs.
- B8.5 Understand the operation of drivetrain, fuel, intake, and exhaust systems.
- B8.6 Understand the operation of restraint systems.

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*B9.0 Students understand the concepts, principles, and practices of painting and refinishing:*

- B9.1 Understand how to identify, use, and repair plastics and adhesives.
- B9.2 Know how to prepare surfaces for painting and finishing.
- B9.3 Understand the operation of spray guns and related equipment.
- B9.4 Know how to mix, match, and apply paint.
- B9.5 Understand the causes and cures of paint defects.
- B9.6 Understand how to prepare vehicles for final detail.

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## C. Vehicle Maintenance, Service, and Repair Pathway

The Vehicle Maintenance, Service, and Repair Pathway prepares students for postsecondary education and employment in the transportation industry, which includes, but is not limited to, motor vehicles, rail systems, marine applications, and outdoor power equipment.

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*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:*

- C1.1 Know and understand common environmental conservation practices and their applications.
  - C1.2 Practice the safe handling and storage of chemicals and hazardous wastes in accordance with material safety data sheets and the requirements of local, state, and federal regulatory agencies.
  - C1.3 Understand the way in which waste gasses, emissions, and other environmentally destructive substances are generated and their effects on the environment.
  - C1.4 Evaluate the advantages and disadvantages of existing, new, and emerging systems and the effects of those systems on the environment.
  - C1.5 Use appropriate personal protective equipment and safety practices.
- 

*C2.0 Students understand the safe and appropriate use of tools, equipment, and work processes:*

- C2.1 Understand and use appropriate tools and equipment, such as wrenches, sockets, and pliers, to maintain and repair systems and components.
  - C2.2 Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic and air/pneumatic systems).
  - C2.3 Select and use the appropriate measurement device(s) and use mathematical functions necessary to perform required fabrication, maintenance, and operation procedures.
  - C2.4 Know and understand the elements of precision measuring using standard and metric systems.
  - C2.5 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.
  - C2.6 Know and understand how to access technical reports, manuals, electronic retrieval systems, and related technical data resources.
  - C2.7 Comprehend the importance of calibration processes, systems, and techniques using various measurement and testing devices.
- 

*C3.0 Students understand scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems:*

- C3.1 Understand the operating principles of internal and external combustion engines.

- C3.2 Understand the function and principles of air conditioning and heating systems.
- C3.3 Understand the basic principles of pneumatic and hydraulic power and their applications.
- C3.4 Understand the applications of alternative power sources.
- C3.5 Understand the basic principles of electricity, electronics and electrical power generation, and distribution systems.
- C3.6 Understand the principles of converting energy from one form to another.
- C3.7 Perform necessary procedures to maintain, diagnose, service, and repair vehicle systems and malfunctions.

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*C4.0 Students perform and document maintenance procedures in accordance with the recommendations of the manufacturer:*

- C4.1 Understand the procedures and practices of various manufacturers regarding repair and maintenance schedules.
- C4.2 Know how to properly document maintenance procedures in accordance with applicable rules, laws, and regulations (e.g., Bureau of Auto Repair [BAR], Occupational Health and Safety Administration [OSHA], and the California Air Resources Board [CARB]).
- C4.3 Use reference books, technical service bulletins, and other documents and materials related to the automotive service industry available in print and through electronic retrieval systems to accurately diagnose and repair vehicles.
- C4.4 Complete a work order, including customer information, description of repairs, and billing information, in accordance with applicable rules, laws, and regulations.

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*C5.0 Students understand and apply appropriate business practices:*

- C5.1 Understand work-related systems common to the transportation service industry.
- C5.2 Know the laws and regulations applicable to recordkeeping and the appropriate handling and disposal of hazardous materials.
- C5.3 Understand the importance of and the procedures for maintaining accurate records (e.g., business licenses, repair orders, billing and tax records).
- C5.4 Understand the concept and application of accepted ethical business practices.
- C5.5 Understand the concept and application of acceptable customer relations practices.
- C5.6 Understand the need for maintenance of components and systems and the conditions under which service and maintenance are required

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*C6.0 Students understand the application, operation, maintenance, and diagnosis of engines, including but not limited to two- and four-stroke and supporting subsystems:*

- C6.1 Perform general engine maintenance, diagnosis, service, and repair in accordance with portable national industry standards, such as the National Automotive Technicians Education Foundation and the Equipment and Engine Training Council.

- C6.2 Maintain, diagnose, service, and repair lubrication and cooling systems.
- C6.3 Understand how to maintain, diagnose, and repair computerized engine control systems and other engine-related systems.
- C6.4 Maintain, diagnose, service, and repair ignition, electronic, and computerized engine controls and fuel management systems.

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C7.0 *Students understand the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards:*

- C7.1 Understand how to maintain, diagnose, and repair electrical systems.
- C7.2 Maintain, diagnose, repair, and service batteries.
- C7.3 Understand how to maintain, diagnose, service, and repair starting and charging systems.
- C7.4 Diagnose, service, and repair lighting systems.
- C7.5 Diagnose, service, and repair heating and air conditioning systems and components.
- C7.6 Diagnose, service, and repair horns, wipers/washers, and other accessories.
- C7.7 Perform necessary procedures to maintain, diagnose, service, and repair vehicle electrical and electronic systems and malfunctions.

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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.*

- C8.1 Understand how to maintain, diagnose, service, and repair hydraulic and power assist systems.
- C8.2 Diagnose, service, and repair disc brakes, drum brakes, antilock brakes, and other brake systems as developed.
- C8.3 Diagnose, service, and repair steering and suspension systems.
- C8.4 Understand the function and operation of automatic and manual transmissions and transaxles.
- C8.5 Understand tire and rim sizing to select appropriate wheels and tires for vehicles.
- C8.6 Maintain, diagnose, service, and repair under-vehicle systems and malfunctions.



The background of the page features a large, light gray watermark of the Seal of the Alaska Board of Education. The seal is circular and contains the text "BOARD OF EDUCATION" at the top and "ALASKA" at the bottom. The central figure is a Native Alaskan woman in traditional dress, holding a spear. Below her is a bear, and to the left is a scene with a boat and a person. The seal is surrounded by a rope-like border and several stars.

## Appendix

### *Career Technical Education and Academic Standards Crosswalk*

- ◆ Mathematics
- ◆ Science
- ◆ History–Social Science
- ◆ Visual and Performing Arts
- ◆ English–Language Arts



**MEASUREMENT AND GEOMETRY (GRADE SEVEN)**

	Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
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).	X		X					X						X
1.2 Construct and read drawings and models made to scale.	X							X						
1.3 Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.								X						
2.4 Relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches or [1 ft <sup>2</sup> ] = [144 in <sup>2</sup> ], 1 cubic inch is approximately 16.38 cubic centimeters or [1 in <sup>3</sup> ] = [16.38 cm <sup>3</sup> ]).				X							X			X

**STATISTICS, DATA ANALYSIS, AND PROBABILITY (GRADE SEVEN)**

1.1 Know various forms of display for data sets, including a stem-and-leaf plot or box-and-whisker plot; use the forms to display a single set of data or to compare two sets of data.							X		X		X			
1.2 Represent two numerical variables on a scatterplot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level).							X		X		X			
1.3 Understand the meaning of, and be able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.							X		X	X	X			

**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.			X		X	X	X	X	X	X		X		
1.2 Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.								X						
1.3 Determine when and how to break a problem into simpler parts.	X							X						
2.1 Use estimation to verify the reasonableness of calculated results.		X	X	X	X	X	X		X	X	X	X		X
2.2 Apply strategies and results from simpler problems to more complex problems.		X	X	X	X	X	X		X	X	X	X		X

**MATHEMATICAL REASONING (GRADE SEVEN) (Continued)**

		Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
2.3	Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.		X X	X X	X X	X X	X X		X X	X X	X X				X
2.4	Make and test conjectures by using both inductive and deductive reasoning.		X X	X X	X X	X X	X X		X X	X X	X X				X
2.5	Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.		X X	X X	X X	X X	X X		X X	X X	X X				X
2.6	Express the solution clearly and logically by using the appropriate mathematical notation and terms and clear language; support solutions with evidence in both verbal and symbolic work.		X X	X X	X X	X X	X X		X X	X X	X X				X
2.7	Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.		X X	X X	X X	X X	X X		X X	X X	X X				X
2.8	Make precise calculations and check the validity of the results from the context of the problem.		X X	X X	X X	X X	X X		X X	X X	X X				X
3.1	Evaluate the reasonableness of the solution in the context of the original situation.	X	X X	X X	X X	X X	X X		X X	X X	X X				X
3.2	Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.		X X	X X	X X	X X	X X		X X	X X	X X				X
3.3	Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.		X X	X X	X X	X X	X X		X X	X X	X X				X

**ALGEBRA I (GRADES EIGHT THROUGH TWELVE)**

1.1	Students use properties of numbers to demonstrate whether assertions are true or false.			X X	X X	X X			X X	X X	X X				X
2.0	Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.					X									
3.0	Students solve equations and inequalities involving absolute values.					X									
4.0	Students simplify expressions before solving linear equations and inequalities in one variable, such as $3(2x-5) + 4(x-2) = 12$ .		X												
5.0	Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.		X	X X	X		X		X X	X X	X X	X X	X X		
6.0	Students graph a linear equation and compute the $x$ - and $y$ - intercepts (e.g., graph $2x + 6y = 4$ ). They are also able to sketch the region defined by linear inequality (e.g., they sketch the region defined by $2x + 6y < 4$ ).										X				

**ALGEBRA I (GRADES EIGHT THROUGH TWELVE) (Continued)**

	Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
8.0				X							X			X
10.0	X										X			
12.0	X			X	X						X			X
13.0	X		X			X	X		X	X		X		
15.0	X	X	X	X	X		X		X		X	X	X	X
24.1		X		X	X	X	X		X	X		X	X	X
24.2		X		X		X	X		X	X		X	X	X
24.3		X		X		X	X		X	X		X	X	X
25.1		X					X		X		X	X		
25.2		X					X		X		X	X		
25.3		X					X		X		X	X		

**GEOMETRY (GRADES EIGHT THROUGH TWELVE)**

3.0		X												
8.0	X	X	X			X			X		X			



## Science

### FOCUS ON LIFE SCIENCE (GRADE SEVEN)

	Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
1.a								X						
5.a								X						
5.b								X						
5.c								X						
5.d								X						
5.e								X						
5.g								X						

### PHYSICS (GRADES NINE THROUGH TWELVE)

1.d														X
3.a		X	X	X						X				X
3.b					X									
3.c					X									
3.f										X				
3.g		X	X	X						X				
4.d	X													

**PHYSICS (GRADES NINE THROUGH TWELVE)** *(Continued)*

		Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
4.e	Students know radio waves, light, and X-rays are different wavelength bands in the spectrum of electromagnetic waves whose speed in a vacuum is approximately $3 \times 10^8$ m/s (186,000 miles/second).	X													
4.f	Students know how to identify the characteristic properties of waves: interference (beats), diffraction, refraction, Doppler effect, and polarization.	X													
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.				X							X			X
5.b	Students know how to solve problems involving Ohm's law.		X	X								X			X
5.c	Students know any resistive element in a DC circuit dissipates energy, which heats the resistor. Students can calculate the power (rate of energy dissipation) in any resistive circuit element by using the formula $\text{Power} = IR$ (potential difference) $\times$ $I$ (current) = $I^2R$ .	X													
5.d	Students know the properties of transistors and the role of transistors in electric circuits.	X													
<b>CHEMISTRY (GRADES NINE THROUGH TWELVE)</b>															
1.a	Students know how to relate the position of an element in the periodic table to its atomic number and atomic mass.						X		X						
1.b	Students know how to use the periodic table to identify metals, semimetals, nonmetals, and halogens.						X		X						
1.c	Students know how to use the periodic table to identify alkali metals, alkaline earth metals and transition metals, trends in ionization energy, electronegativity, and the relative sizes of ions and atoms.									X					
1.d	Students know how to use the periodic table to determine the number of electrons available for bonding.									X					
1.e	Students know the nucleus of the atom is much smaller than the atom yet contains most of its mass.									X					
1.f	Students know how to use the periodic table to identify the lanthanide, actinide, and transactinide elements and know that the transuranium elements were synthesized and identified in laboratory experiments through the use of nuclear accelerators.									X					
1.g	Students know how to relate the position of an element in the periodic table to its quantum electron configuration and to its reactivity with other elements in the table.									X					



**CHEMISTRY (GRADES NINE THROUGH TWELVE) (Continued)**

		Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
1.h	Students know the experimental basis for Thomson's discovery of the electron, Rutherford's nuclear atom, Millikan's oil drop experiment, and Einstein's explanation of the photoelectric effect.									X					
1.i	Students know the experimental basis for the development of the quantum theory of atomic structure and the historical importance of the Bohr model of the atom.									X					
1.j	Students know that spectral lines are the result of transitions of electrons between energy levels and that these lines correspond to photons with a frequency related to the energy spacing between levels by using Planck's relationship ( $E = hv$ ).									X					
2.a	Students know atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds.						X			X					
2.b	Students know chemical bonds between atoms in molecules such as $H_2$ , $CH_4$ , $NH_3$ , $H_2CCH_2$ , $N_2$ , $Cl_2$ , and many large biological molecules are covalent.									X					
2.c	Students know salt crystals, such as NaCl, are repeating patterns of positive and negative ions held together by electrostatic attraction.									X					
2.d	Students know the atoms and molecules in liquids move in a random pattern relative to one another because the intermolecular forces are too weak to hold the atoms or molecules in a solid form.									X					
2.e	Students know how to draw Lewis dot structures.									X					
2.f	Students know how to predict the shape of simple molecules and their polarity from Lewis dot structures.									X					
2.g	Students know how electronegativity and ionization energy relate to bond formation.									X					
2.h	Students know how to identify solids and liquids held together by van der Waals forces or hydrogen bonding and relate these forces to volatility and boiling/melting point temperatures.									X					
5.a	Students know the observable properties of acids, bases, and salt solutions.						X			X					
5.b	Students know acids are hydrogen-ion-donating and bases are hydrogen-ion-accepting substances.									X					
5.c	Students know strong acids and bases fully dissociate and weak acids and bases partially dissociate.									X					
5.d	Students know how to use the pH scale to characterize acid and base solutions.						X			X					
5.e	Students know the Arrhenius, Brønsted-Lowry, and Lewis acid–base definitions.									X					

**CHEMISTRY (GRADES NINE THROUGH TWELVE) (Continued)**

		Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
5.f	Students know how to calculate pH from the hydrogen-ion concentration.								X						
5.g	Students know buffers stabilize pH in acid–base reactions.								X						
10.a	Students know large molecules (polymers), such as proteins, nucleic acids, and starch, are formed by repetitive combinations of simple subunits.								X						
10.b	Students know the bonding characteristics of carbon that result in the formation of a large variety of structures ranging from simple hydrocarbons to complex polymers and biological molecules.								X						
10.c	Students know amino acids are the building blocks of proteins.								X						
10.d	Students know the system for naming the ten simplest linear hydrocarbons and isomers that contain single bonds, simple hydrocarbons with double and triple bonds, and simple molecules that contain a benzene ring.								X						
10.e	Students know how to identify the functional groups that form the basis of alcohols, ketones, ethers, amines, esters, aldehydes, and organic acids.								X						
10.f	Students know the R-group structure of amino acids and know how they combine to form the polypeptide backbone structure of proteins.								X						
<b>BIOLOGY/LIFE SCIENCES (GRADES NINE THROUGH TWELVE)</b>															
1.a	Students know cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings.								X						
1.b	Students know enzymes are proteins that catalyze biochemical reactions without altering the reaction equilibrium and the activities of enzymes depend on the temperature, ionic conditions, and the pH of the surroundings.								X						
1.c	Students know how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure.								X						
1.d	Students know the central dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm.								X						
1.e	Students know the role of the endoplasmic reticulum and Golgi apparatus in the secretion of proteins.								X						
1.f	Students know usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.								X						

**BIOLOGY/LIFE SCIENCES (GRADES NINE THROUGH TWELVE) (Continued)**

		Agriculture	Arts, Media	Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
1.g	Students know the role of the mitochondria in making stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide.									X						
1.h	Students know most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from a small collection of simple precursors.									X						
1.i	Students know how chemiosmotic gradients in the mitochondria and chloroplast store energy for ATP production.									X						
1.j	Students know how eukaryotic cells are given shape and internal organization by a cytoskeleton or cell wall or both.									X						
2.a	Students know meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.									X						
2.b	Students know only certain cells in a multicellular organism undergo meiosis.									X						
2.c	Students know how random chromosome segregation explains the probability that a particular allele will be in a gamete.									X						
2.d	Students know new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).									X						
2.e	Students know why approximately half of an individual's DNA sequence comes from each parent.									X						
2.f	Students know the role of chromosomes in determining an individual's sex.									X						
2.g	Students know how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents.									X						
3.a	Students know how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive).									X						
3.b	Students know the genetic basis for Mendel's laws of segregation and independent assortment.									X						
3.c	Students know how to predict the probable mode of inheritance from a pedigree diagram showing phenotypes.									X						
3.d	Students know how to use data on frequency of recombination at meiosis to estimate genetic distances between loci and to interpret genetic maps of chromosomes.									X						

**BIOLOGY/LIFE SCIENCES (GRADES NINE THROUGH TWELVE) (Continued)**

		Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
4.a	Students know the general pathway by which ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA.								X						
4.b	Students know how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA.								X						
4.c	Students know how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.								X						
4.d	Students know specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.								X						
4.e	Students know proteins can differ from one another in the number and sequence of amino acids.								X						
4.f	Students know why proteins having different amino acid sequences typically have different shapes and chemical properties.								X						
5.d	Students know how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation, and transformation) is used to construct recombinant DNA molecules.								X						
5.e	Students know how exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products.								X						
9.a	Students know how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.								X						
9.b	Students know how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.								X						
9.c	Students know how feedback loops in the nervous and endocrine systems regulate conditions in the body.								X						
9.d	Students know the functions of the nervous system and the role of neurons in transmitting electrochemical impulses.								X						
9.e	Students know the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response.								X						
9.f	Students know the individual functions and sites of secretion of digestive enzymes (amylases, proteases, nucleases, lipases), stomach acid, and bile salts.								X						
9.g	Students know the homeostatic role of the kidneys in the removal of nitrogenous wastes and the role of the liver in blood detoxification and glucose balance.								X						

**BIOLOGY/LIFE SCIENCES (GRADES NINE THROUGH TWELVE) (Continued)**

	Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
9.h Students know the cellular and molecular basis of muscle contraction, including the roles of actin, myosin, Ca <sup>+2</sup> , and ATP.								X						
9.i Students know how hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.								X						
10.a Students know the role of the skin in providing nonspecific defenses against infection.								X						
10.b Students know the role of antibodies in the body's response to infection.								X						
10.c Students know how vaccination protects an individual from infectious diseases.								X						
10.d Students know there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.								X						
10.e Students know why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.								X						
10.f Students know the roles of phagocytes, B-lymphocytes, and T-lymphocytes in the immune system.								X						

**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.	X	X	X	X	X	X	X		X	X	X	X	X	X
1.b Identify and communicate sources of unavoidable experimental error. ARTS		X												
1.c Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.	X	X											X	
1.d Formulate explanations by using logic and evidence.	X	X	X	X		X	X	X	X	X	X	X	X	X
1.e Solve scientific problems by using quadratic equations and simple trigonometric, exponential, and logarithmic functions.													X	
1.f Distinguish between hypothesis and theory as scientific terms.	X	X											X	
1.g Recognize the usefulness and limitations of models and theories as scientific representations of reality.		X											X	
1.h Read and interpret topographic and geologic maps.													X	

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**INVESTIGATION AND EXPERIMENTATION (GRADES NINE THROUGH TWELVE) (Continued)**

	Agriculture	Arts, Media	Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
1.j Recognize the issues of statistical variability and the need for controlled tests.	X													X	
1.l Analyze situations and solve problems that require combining and applying concepts from more than one area of science.	X	X				X								X	X
1.m Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.	X			X			X			X					

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# History–Social Science

## HISTORICAL AND SOCIAL SCIENCES ANALYSIS SKILLS (GRADES NINE THROUGH TWELVE INTRO)

### CHRONOLOGICAL AND SPATIAL THINKING (GRADES NINE THROUGH TWELVE INTRO)

1. Students compare the present with the past, evaluating the consequences of past events and decisions and determining the lessons that were learned.
2. Students analyze how change happens at different rates at different times; understand that some aspects can change while others remain the same; and understand that change is complicated and affects not only technology and politics but also values and beliefs.

### HISTORICAL RESEARCH, EVIDENCE, AND POINT OF VIEW (GRADES NINE THROUGH TWELVE INTRO)

1. Students distinguish valid arguments from fallacious arguments in historical interpretations.
2. Students identify bias and prejudice in historical interpretations.
4. Students construct and test hypotheses; collect, evaluate, and employ information from multiple primary and secondary sources; and apply it in oral and written presentations.

### HISTORICAL INTERPRETATION (GRADES NINE THROUGH TWELVE INTRO)

1. Students show the connections, causal and otherwise, between particular historical events and larger social, economic, and political trends and developments.
2. Students recognize the complexity of historical causes and effects, including the limitations on determining cause and effect.
3. Students interpret past events and issues within the context in which an event unfolded rather than solely in terms of present-day norms and values.
4. Students understand the meaning, implication, and impact of historical events and recognize that events could have taken other directions.

	Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
1. Students compare the present with the past, evaluating the consequences of past events and decisions and determining the lessons that were learned.			X		X			X						
2. Students analyze how change happens at different rates at different times; understand that some aspects can change while others remain the same; and understand that change is complicated and affects not only technology and politics but also values and beliefs.	X		X		X			X						
1. Students distinguish valid arguments from fallacious arguments in historical interpretations.	X													
2. Students identify bias and prejudice in historical interpretations.	X													
4. Students construct and test hypotheses; collect, evaluate, and employ information from multiple primary and secondary sources; and apply it in oral and written presentations.	X													
1. Students show the connections, causal and otherwise, between particular historical events and larger social, economic, and political trends and developments.	X		X		X			X						
2. Students recognize the complexity of historical causes and effects, including the limitations on determining cause and effect.	X													
3. Students interpret past events and issues within the context in which an event unfolded rather than solely in terms of present-day norms and values.	X													
4. Students understand the meaning, implication, and impact of historical events and recognize that events could have taken other directions.	X													





**WORLD HISTORY, CULTURE, AND GEOGRAPHY: THE MODERN WORLD (GRADE TEN)** *(Continued)*

	Agriculture	Arts, Media	Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
10.6 Students analyze the effects of the First World War.															
10.6.4 Discuss the influence of World War I on literature, art, and intellectual life in the West (e.g., Pablo Picasso, the “lost generation” of Gertrude Stein, Ernest Hemingway).		X													
10.10 Students analyze instances of nation-building in the contemporary world in at least two of the following regions or countries: the Middle East, Africa, Mexico and other parts of Latin America, and China.															
10.10.2 Describe the recent history of the regions, including political divisions and systems, key leaders, religious issues, natural features, resources, and population patterns.				X											
10.11 Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).		X	X				X		X						

**UNITED STATES HISTORY AND GEOGRAPHY: CONTINUITY AND CHANGE IN THE TWENTIETH CENTURY (GRADE ELEVEN)**

11.1 Students analyze the significant events in the founding of the nation and its attempts to realize the philosophy of government described in the Declaration of Independence.															X
11.1.1 Describe the Enlightenment and the rise of democratic ideas as the context in which the nation was founded.															X
11.1.2 Analyze the ideological origins of the American Revolution, the Founding Fathers’ philosophy of divinely bestowed unalienable natural rights, the debates on the drafting and ratification of the Constitution, and the addition of the Bill of Rights.															X
11.1.3 Understand the history of the Constitution after 1787 with emphasis on federal versus state authority and growing democratization.															X
11.1.4 Examine the effects of the Civil War and Reconstruction and of the industrial revolution, including demographic shifts and the emergence in the late nineteenth century of the United States as a world power.															X

**UNITED STATES HISTORY AND GEOGRAPHY: CONTINUITY AND CHANGE IN THE TWENTIETH CENTURY (GRADE ELEVEN)** *(Continued)*

	Agriculture	Arts, Media	Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
11.3 Students analyze the role religion played in the founding of America, its lasting moral, social, and political impacts, and issues regarding religious liberty.															X
11.3.1 Describe the contributions of various religious groups to American civic principles and social reform movements (e.g., civil and human rights, individual responsibility and the work ethic, antimonarchy and self-rule, worker protection, family-centered communities).															X
11.3.2 Analyze the great religious revivals and the leaders involved in them, including the First Great Awakening, the Second Great Awakening, the Civil War revivals, the Social Gospel Movement, the rise of Christian liberal theology in the nineteenth century, the impact of the Second Vatican Council, and the rise of Christian fundamentalism in current times.															X
11.3.3 Cite incidences of religious intolerance in the United States (e.g., persecution of Mormons, anti-Catholic sentiment, anti-Semitism).															X
11.3.4 Discuss the expanding religious pluralism in the United States and California that resulted from large-scale immigration in the twentieth century.															X
11.3.5 Describe the principles of religious liberty found in the Establishment and Free Exercise clauses of the First Amendment, including the debate on the issue of separation of church and state.															X
11.5 Students analyze the major political, social, economic, technological, and cultural developments of the 1920s.		X	X		X	X						X			
11.5.4 Analyze the passage of the Nineteenth Amendment and the changing role of women in society.						X									
11.5.5 Describe the Harlem Renaissance and new trends in literature, music, and art, with special attention to the work of writers (e.g., Zora Neale Hurston, Langston Hughes).		X													
11.5.6 Trace the growth and effects of radio and movies and their role in the worldwide diffusion of popular culture.		X													
11.5.7 Discuss the rise of mass production techniques, the growth of cities, the impact of new technologies (e.g., the automobile, electricity), and the resulting prosperity and effect on the American landscape.		X	X	X	X	X						X			X

**UNITED STATES HISTORY AND GEOGRAPHY: CONTINUITY AND CHANGE IN THE TWENTIETH CENTURY (GRADE ELEVEN)** *(Continued)*

	Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
11.7 Students analyze America’s participation in World War II.				X	X						X			
11.7.6 Describe major developments in aviation, weaponry, communication, and medicine and the war’s impact on the location of American industry and use of resources.				X	X						X			
11.8 Students analyze the economic boom and social transformation of post-World War II America.				X	X	X		X	X		X			
11.8.1 Trace the growth of service sector, white collar, and professional sector jobs in business and government.								X	X					
11.8.2 Describe the significance of Mexican immigration and its relationship to the agricultural economy, especially in California.									X					
11.8.7 Describe the effects on society and the economy of technological developments since 1945, including the computer revolution, changes in communication, advances in medicine, and improvements in agricultural technology.				X	X	X	X	X	X		X			X
11.8.8 Discuss forms of popular culture, with emphasis on their origins and geographic diffusion (e.g., jazz and other forms of popular music, professional sports, architectural and artistic styles).		X						X	X					
11.10 Students analyze the development of federal civil rights and voting rights.														X
11.10.1 Explain how demands of African Americans helped produce a stimulus for civil rights, including President Roosevelt’s ban on racial discrimination in defense industries in 1941, and how African Americans’ service in World War II produced a stimulus for President Truman’s decision to end segregation in the armed forces in 1948.														X
11.10.2 Examine and analyze the key events, policies, and court cases in the evolution of civil rights, including <i>Dred Scott v. Sandford</i> , <i>Plessy v. Ferguson</i> , <i>Brown v. Board of Education</i> , <i>Regents of the University of California v. Bakke</i> , and California Proposition 209.														X
11.10.3 Describe the collaboration on legal strategy between African American and white civil rights lawyers to end racial segregation in higher education.														X
11.10.4 Examine the roles of civil rights advocates (e.g., A. Philip Randolph, Martin Luther King, Jr., Malcom X, Thurgood Marshall, James Farmer, Rosa Parks), including the significance of Martin Luther King, Jr.’s “Letter from Birmingham Jail” and “I Have a Dream” speech.														X

**UNITED STATES HISTORY AND GEOGRAPHY: CONTINUITY AND CHANGE IN THE TWENTIETH CENTURY (GRADE ELEVEN)** *(Continued)*

	Agriculture	Arts, Media	Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
11.10.5															X
11.10.6															X
11.10.7															X
11.11					X		X	X		X	X	X			
11.11.1								X		X		X			
11.11.2								X		X		X			
11.11.3				X	X		X	X		X	X	X			X
11.11.4								X		X		X			
11.11.5								X		X		X			
11.11.6								X	X	X		X			
11.11.7								X	X	X		X			





**PRINCIPLES OF AMERICAN DEMOCRACY (GRADE TWELVE)** *(Continued)*

	Agriculture	Arts, Media	Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
12.4.4															X
12.4.5															X
12.4.6															X
12.5															X
12.5.1															X
12.5.2															X
12.5.3															X
12.5.4															X
12.6															X
12.6.1															X
12.6.2															X
12.6.3															X





**PRINCIPLES OF AMERICAN DEMOCRACY (GRADE TWELVE)** *(Continued)*

	Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
12.8.3	Explain how public officials use the media to communicate with the citizenry and to shape public opinion.													
12.9	Students analyze the origins, characteristics, and development of different political systems across time, with emphasis on the quest for political democracy, its advances, and its obstacles.													
12.9.1	Explain how the different philosophies and structures of feudalism, mercantilism, socialism, fascism, communism, monarchies, parliamentary systems, and constitutional liberal democracies influence economic policies, social welfare policies, and human rights practices.													
12.9.2	Compare the various ways in which power is distributed, shared, and limited in systems of shared powers and in parliamentary systems, including the influence and role of parliamentary leaders (e.g., William Gladstone, Margaret Thatcher).													
12.9.3	Discuss the advantages and disadvantages of federal, confederal, and unitary systems of government.													
12.9.4	Describe for at least two countries the consequences of conditions that gave rise to tyrannies during certain periods (e.g., Italy, Japan, Haiti, Nigeria, Cambodia).													
12.9.5	Identify the forms of illegitimate power that twentieth-century African, Asian, and Latin American dictators used to gain and hold office and the conditions and interests that supported them.													
12.9.6	Identify the ideologies, causes, stages, and outcomes of major Mexican, Central American, and South American revolutions in the nineteenth and twentieth centuries.													
12.9.7	Describe the ideologies that give rise to Communism, methods of maintaining control, and the movements to overthrow such governments in Czechoslovakia, Hungary, and Poland, including the roles of individuals (e.g., Alexander Solzhenitsyn, Pope John Paul II, Lech Walesa, Vaclav Havel).													
12.9.8	Identify the successes of relatively new democracies in Africa, Asia, and Latin America and the ideas, leaders, and general societal conditions that have launched and sustained, or failed to sustain, them.													

**PRINCIPLES OF AMERICAN DEMOCRACY (GRADE TWELVE)** *(Continued)*

12.10 Students formulate questions about and defend their analyses of tensions within our constitutional democracy and the importance of maintaining a balance between the following concepts: majority rule and individual rights; liberty and equality; state and national authority in a federal system; civil disobedience and the rule of law; freedom of the press and the right to a fair trial; the relationship of religion and government.

	Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
													X	
<b>PRINCIPLES OF ECONOMICS (GRADE TWELVE)</b>														
12.1	Students understand common economic terms and concepts and economic reasoning.		X X		X X X			X X	X X		X			
12.1.1	Examine the causal relationship between scarcity and the need for choices.		X X		X X X			X X	X X		X			
12.1.2	Explain opportunity cost and marginal benefit and marginal cost.		X X		X X X			X X	X X		X			
12.1.3	Identify the difference between monetary and nonmonetary incentives and how changes in incentives cause changes in behavior.		X X		X X X			X X	X X		X			
12.1.4	Evaluate the role of private property as an incentive in conserving and improving scarce resources, including renewable and nonrenewable natural resources.		X X		X		X		X		X			
12.1.5	Analyze the role of a market economy in establishing and preserving political and personal liberty (e.g., through the works of Adam Smith).		X		X		X		X		X			
12.2	Students analyze the elements of America’s market economy in a global setting.	X X	X X		X X X			X X	X X		X			
12.2.1	Understand the relationship of the concept of incentives to the law of supply and the relationship of the concept of incentives and substitutes to the law of demand.		X X X		X X X			X X	X X		X			
12.2.2	Discuss the effects of changes in supply and/or demand on the relative scarcity, price, and quantity of particular products.	X	X X		X X X			X X	X X		X			
12.2.3	Explain the roles of property rights, competition, and profit in a market economy.	X	X X		X X X			X X	X X		X			
12.2.4	Explain how prices reflect the relative scarcity of goods and services and perform the allocative function in a market economy.		X X X		X X X			X X	X X		X			
12.2.5	Understand the process by which competition among buyers and sellers determines a market price.	X X	X X		X X X			X X	X X		X			
12.2.6	Describe the effect of price controls on buyers and sellers.	X	X X		X X X			X X	X X		X			
12.2.7	Analyze how domestic and international competition in a market economy affects goods and services produced and the quality, quantity, and price of those products.	X X	X X		X X X			X X	X X		X			
12.2.8	Explain the role of profit as the incentive to entrepreneurs in a market economy.		X X X		X X X			X X	X X		X			

**PRINCIPLES OF ECONOMICS (GRADE TWELVE) (Continued)**

	Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
12.2.9 Describe the functions of the financial markets.		X X	X		X	X			X		X			
12.2.10 Discuss the economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.	X	X			X	X			X		X			
12.3 Students analyze the influence of the federal government on the American economy.		X X X			X X X				X X		X			
12.3.1 Understand how the role of government in a market economy often includes providing for national defense, addressing environmental concerns, defining and enforcing property rights, attempting to make markets more competitive, and protecting consumers' rights.			X X		X	X			X X		X			
12.3.2 Identify the factors that may cause the costs of government actions to outweigh the benefits.			X X		X	X			X		X			
12.3.3 Describe the aims of government fiscal policies (taxation, borrowing, spending) and their influence on production, employment, and price levels.		X X X			X X X				X X		X			
12.3.4 Understand the aims and tools of monetary policy and their influence on economic activity (e.g., the Federal Reserve).			X X		X	X			X		X			
12.4 Students analyze the elements of the U.S. labor market in a global setting.	X X	X X			X X X				X X		X			
12.4.1 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.		X X X			X X X				X X		X			
12.4.2 Describe the current economy and labor market, including the types of goods and services produced, the types of skills workers need, the effects of rapid technological change, and the impact of international competition.			X X		X X X				X X		X			
12.4.3 Discuss wage differences among jobs and professions, using the laws of demand and supply and the concept of productivity.	X X	X X			X X X				X X		X			
12.4.4 Explain the effects of international mobility of capital and labor on the U.S. economy.			X X		X X X				X		X			
12.5 Students analyze the aggregate economic behavior of the U.S. economy.							X		X		X			
12.5.1 Distinguish between nominal and real data.							X		X		X			
12.5.2 Define, calculate, and explain the significance of an unemployment rate, the number of new jobs created monthly, an inflation or deflation rate, and a rate of economic growth.							X		X		X			

**PRINCIPLES OF ECONOMICS (GRADE TWELVE) (Continued)**

	Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
12.5.3							X		X		X			
12.6		X	X		X	X	X		X	X		X		
12.6.1		X	X		X		X		X	X		X		
12.6.2		X	X		X		X			X		X		
12.6.3		X	X		X	X	X		X	X		X		
12.6.4		X	X		X	X	X		X	X		X		

# Visual and Performing Arts

## DANCE CONTENT STANDARDS – PROFICIENT

	Agriculture	Arts, Media	Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
2.2 Identify and apply basic music elements (e.g., rhythm, meter, tempo, timbre) to construct and perform dances.	X														
2.3 Design a dance that utilizes an established dance style or genre.	X														
2.4 Perform original works that employ personal artistic intent and communicate effectively.	X														
2.5 Perform works by various dance artists communicating the original intent of the work while employing personal artistic intent and interpretation.	X														
3.2 Describe ways in which folk/traditional, social, and theatrical dances reflect their specific cultural context.	X														
4.1 Describe how the qualities of a theatrical production contribute to the success of a dance performance (e.g., music, lighting, costuming, text, set design).	X														
5.5 Examine the training, education, and experience needed to pursue dance career options (e.g., performer, choreographer, dance therapist, teacher, historian, critic, filmmaker).	X														

## DANCE CONTENT STANDARDS – ADVANCED

1.1 Demonstrate highly developed physical coordination and control when performing complex locomotor and axial movement phrases from a variety of genres (e.g., refined body articulation, agility, balance, strength).	X														
1.2 Perform in multiple dance genres, integrating an advanced level of technical skill and clear intent.	X														
1.3 Memorize and perform complicated works of dance at a level of professionalism (i.e., a high level of refinement).	X														
1.4 Apply a wide range of kinesthetic communication, demonstrating clarity of intent and stylistic nuance.	X														
1.5 Select specific dance vocabulary to describe movement and dance elements in great detail.	X														
2.1 Create a diverse body of works of dance, each of which demonstrates originality, unity, clarity of intent, and a dynamic range of movement.	X														
2.2 Use dance structures, musical forms, theatrical elements, and technology to create original works.	X														

















**VISUAL ARTS CONTENT STANDARDS – ADVANCED** *(Continued)*

	Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
5.1 Speculate on how advances in technology might change the definition and function of the visual arts.	X				X									
5.2 Compare and contrast works of art, probing beyond the obvious and identifying psychological content found in the symbols and images.	X													
5.3 Prepare portfolios of their original works of art for a variety of purposes (e.g., review for postsecondary application, exhibition, job application, and personal collection).	X				X	X					X			
5.4 Investigate and report on the essential features of modern or emerging technologies that affect or will affect visual artists and the definition of the visual arts.	X													









WRITING (GRADES NINE AND TEN)		Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
1.1	Establish a controlling impression or coherent thesis that conveys a clear and distinctive perspective on the subject and maintain a consistent tone and focus throughout the piece of writing.	X													
1.2	Use precise language, action verbs, sensory details, appropriate modifiers, and the active rather than the passive voice.	X													
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.	X	X	X	X	X	X	X		X	X	X	X		X
1.4	Develop the main ideas within the body of the composition through supporting evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions).		X	X	X	X		X		X	X	X	X		X
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).	X		X	X	X	X	X	X	X	X	X	X		X
1.6	Integrate quotations and citations into a written text while maintaining the flow of ideas.			X				X		X	X	X			
1.7	Use appropriate conventions for documentation in the text, notes, and bibliographies by adhering to those in style manuals (e.g., <i>Modern Language Association Handbook</i> , <i>The Chicago Manual of Style</i> ).			X		X		X		X	X	X			X
1.8	Design and publish documents by using advanced publishing software and graphic programs.			X	X	X		X		X	X	X			X
1.9	Revise writing to improve the logic and coherence of the organization and controlling perspective, the precision of word choice, and the tone by taking into consideration the audience, purpose, and formality of the context.			X				X		X		X			





**WRITING (GRADES ELEVEN AND TWELVE) (Continued)**

	Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
2.2 Write responses to literature: <ol style="list-style-type: none"> <li>Demonstrate a comprehensive understanding of the significant ideas in works or passages.</li> <li>Analyze the use of imagery, language, universal themes, and unique aspects of the text.</li> <li>Support important ideas and viewpoints through accurate and detailed references to the text and to other works.</li> <li>Demonstrate an understanding of the author’s use of stylistic devices and an appreciation of the effects created.</li> <li>Identify and assess the impact of perceived ambiguities, nuances, and complexities within the text.</li> </ol>		X												
2.3 Write reflective compositions: <ol style="list-style-type: none"> <li>Explore the significance of personal experiences, events, conditions, or concerns by using rhetorical strategies (e.g., narration, description, exposition, persuasion).</li> <li>Draw comparisons between specific incidents and broader themes that illustrate the writer’s important beliefs or generalizations about life.</li> <li>Maintain a balance in describing individual incidents and relate those incidents to more general and abstract ideas.</li> </ol>		X						X						
2.4 Write historical investigation reports: <ol style="list-style-type: none"> <li>Use exposition, narration, description, argumentation, exposition, or some combination of rhetorical strategies to support the main proposition.</li> <li>Analyze several historical records of a single event, examining critical relationships between elements of the research topic.</li> <li>Explain the perceived reason or reasons for the similarities and differences in historical records with information derived from primary and secondary sources to support or enhance the presentation.</li> <li>Include information from all relevant perspectives and take into consideration the validity and reliability of sources.</li> <li>Include a formal bibliography.</li> </ol>		X						X						

**WRITING (GRADES ELEVEN AND TWELVE) (Continued)**

	Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
2.5 Write job applications and resumes:														
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.	X	X	X	X	X	X	X	X	X	X	X	X	X	X
c. Modify the tone to fit the purpose and audience.														
d. Follow the conventional style for that type of document (e.g., resume, memorandum) and use page formats, fonts, and spacing that contribute to the readability and impact of the document.														
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).	X	X	X	X	X	X	X	X	X	X	X	X	X	X
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.														

**WRITTEN AND ORAL ENGLISH LANGUAGE CONVENTIONS (GRADE EIGHT)**

1.4 Edit written manuscripts to ensure that correct grammar is used.														
1.5 Use correct punctuation and capitalization.														
1.6 Use correct spelling conventions.														

**WRITTEN AND ORAL ENGLISH LANGUAGE CONVENTIONS (GRADES NINE AND TEN)**

1.1 Identify and correctly use clauses (e.g., main and subordinate), phrases (e.g., gerund, infinitive, and participial), and mechanics of punctuation (e.g., semicolons, colons, ellipses, hyphens).			X			X	X		X		X			
1.2 Understand sentence construction (e.g., parallel structure, subordination, proper placement of modifiers) and proper English usage (e.g., consistency of verb tenses).			X			X	X		X		X			
1.3 Demonstrate an understanding of proper English usage and control of grammar, paragraph and sentence structure, diction, and syntax.			X			X	X		X		X			
1.4 Produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization.		X	X	X		X	X		X		X		X	



**LISTENING AND SPEAKING (GRADE EIGHT)** *(Continued)*

		Agriculture	Arts, Media Building	Education	Energy	Engineering	Fashion	Finance	Health	Hospitality	Information	Manufacturing	Marketing	Public Services	Transportation
1.8	Evaluate the credibility of a speaker (e.g., hidden agendas, slanted or biased material).		X			X						X			X
1.9	Interpret and evaluate the various ways in which visual image makers (e.g., graphic artists, illustrators, news photographers) communicate information and affect impressions and opinions.		X			X						X			X
2.1	Deliver narrative presentations (e.g., biographical, autobiographical): a. Relate a clear, coherent incident, event, or situation by using well-chosen details. b. Reveal the significance of, and the subject’s attitude about, the incident, event, or situation. c. Employ narrative and descriptive strategies (e.g., relevant dialogue, specific action, physical description, background description, comparison or contrast of characters).		X			X						X			X
2.2	Deliver oral responses to literature: a. Interpret a reading and provide insight. b. Connect the students’ own responses to the writer’s techniques and to specific textual references. c. Draw supported inferences about the effects of a literary work on its audience. d. Support judgments through references to the text, other works, other authors, or personal knowledge.		X			X						X			X
2.3	Deliver research presentations: a. Define a thesis. b. Record important ideas, concepts, and direct quotations from significant information sources and paraphrase and summarize all relevant perspectives on the topic, as appropriate. c. Use a variety of primary and secondary sources and distinguish the nature and value of each. d. Organize and record information on charts, maps, and graphs.		X			X						X			X
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.		X			X						X			X













# Glossary



<b>career pathway</b>	A coherent sequence of rigorous academic and technical courses that allows students to apply academics and develop technical skills in a curricular area. Career pathways prepare students for successful completion of state academic and technical standards and more advanced postsecondary course work related to the career in which they are interested.
<b>declarative knowledge</b>	Information (facts, events, concepts, and principles).
<b>foundation standards</b>	The standards all students need to achieve to master workplace competencies both in the career technical education curriculum and in the workplace. The Secretary’s Commission on Achieving Necessary Skills refers to these essentials as “foundation skills.”
<b>industry sector</b>	A grouping of interrelated occupations and broad industries based on commonalities.
<b>pathway standards</b>	Concise statements that reflect the essential knowledge and skills students are expected to master. Each career pathway comprises three to twelve standards, with two to six subcomponents per standard.
<b>procedural knowledge</b>	Skills (applied abilities or knowledge).
<b>secondary level</b>	A term that describes students’ second level of education; elementary education is the first level. Although the secondary level of education is commonly associated with high school, it may cover grades seven through twelve.
<b>standards</b>	General expectations of what students should know and be able to do.
<b>subcomponents</b>	The specific knowledge and skills encompassed by the standard. These statements are listed below the standard and describe the knowledge and skills expected of students as they move toward mastery of the career technical education standard.



## Selected References

This section begins with a list of standard references that have wide application across many areas of kindergarten-through-grade-twelve education and continues with references arranged according to the industry sector to which they apply. The references were provided by the High School Initiatives/Career Education Office. Questions about the information should be addressed to that office at (916) 319-0893.

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