

# Career Development and Career and Technical Education (2017): Grades 9, 10, 11, 12

Adopted 2017

## Project-Based Research

- 1. The student applies mathematics, science, English language arts, and social studies in an independent study. The student is expected to:** **PB.1**
  - A. select an original independent study project for personal enrichment and career development; **PB.1.A**
  - B. use reading and research skills to investigate self-selected topics and compile a research portfolio; **PB.1.B**
  - C. collaborate with an interdisciplinary team to develop a project; **PB.1.C**
  - D. identify community, state, national, or international issues to select a project; **PB.1.D**
  - E. conduct a project under the supervision of a mentor; **PB.1.E**
  - F. use scientific methods of investigation; **PB.1.F**
  - G. apply statistical concepts to analyze data, evaluate results, and draw conclusions; **PB.1.G**
  - H. compare and contrast findings in a coherent and organized manner; and **PB.1.H**
  - I. present the independent research project to an appropriate audience of experts in the field using a variety of technologies. **PB.1.I**

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- 2. The student uses verbal and nonverbal communication skills. The student is expected to:** **PB.2**
  - A. listen actively and effectively in group discussions; **PB.2.A**
  - B. use a variety of resources to access, process, and collect data relevant to the project; and **PB.2.B**
  - C. document the time and cost to accomplish the project goal. **PB.2.C**

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- 3. The student demonstrates professional ethical behavior standards and legal responsibilities. The student is expected to:** **PB.3**

- A. analyze ethical challenges determined by factors such as cost, new and emerging technologies, and allocation of limited resources; and [PB.3.A](#)
  - B. review legal issues related to the research project. [PB.3.B](#)
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**4. The student designs and develops a research project related to their career interests. The student is expected to:** [PB.4](#)

- A. identify processes to be used in the independent research project; and [PB.4.A](#)
  - B. use resources to complete a project. [PB.4.B](#)
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**5. The student uses technology needed to complete a research project. The student is expected to:** [PB.5](#)

- A. use search engines, databases, and other digital electronic tools effectively to locate information; [PB.5.A](#)
  - B. evaluate quality, accuracy, completeness, reliability, and currency of information from any source; [PB.5.B](#)
  - C. prepare, organize, and present independent research and mentor experiences; [PB.5.C](#)
  - D. receive constructive criticism and revise personal views when valid evidence warrants; and [PB.5.D](#)
  - E. prepare and present research information in appropriate formats to a panel of experts in the field. [PB.5.E](#)
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**6. The student evaluates the research project. The student is expected to:** [PB.6](#)

- A. create weekly progress reports that address time management and goal setting; [PB.6.A](#)
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**Applied Mathematics for  
Technical Professionals**

**1. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:** [AM.1](#)

- A. apply mathematics to problems arising in everyday life, society, and the workplace; [AM.1.A](#)
- B. use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution; [AM.1.B](#)
- C. select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems; [AM.1.C](#)
- D. communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate; [AM.1.D](#)
- E. create and use representations to organize, record, and communicate mathematical ideas; [AM.1.E](#)

- F. analyze mathematical relationships to connect and communicate mathematical ideas; and **AM.1.F**
  - G. display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication. **AM.1.G**
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**2. The student uses mathematical concepts of algebra to explain linear and non-linear applications in business and industry situations. The student is expected to:** **AM.2**

- A. calculate rise and run such as the rise and run of stair stringers or roof pitch; **AM.2.A**
  - B. distinguish the purpose and difference of a linear and non-linear increase and decrease of a variable with time such as cost or profit; **AM.2.B**
  - C. write systems of equations and inequalities from real-life situations that compare "best deal opportunities" with profit and expenses in businesses; **AM.2.C**
  - D. use linear programming to maximize or minimize linear objective function in real-life situations and determine the reasonableness of solutions; **AM.2.D**
  - E. express numbers as powers of 10 in business and industry settings; **AM.2.E**
  - F. determine the powers and roots of numbers; **AM.2.F**
  - G. apply compound interest formulas related to operating a business; and **AM.2.G**
  - H. use exponential decay models to determine the depreciation on equipment used in business and industry and explain the meaning of models. **AM.2.H**
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**3. The student applies geometric concepts to real-world problems in technical situations. The student is expected to:** **AM.3**

- A. identify various geometric figures in order to identify what formulas are needed to solve situational problems; **AM.3.A**
- B. compute measurements such as area, surface area, volume, perimeter, and circumference in order to prepare engineering drawings for projects; **AM.3.B**
- C. use trigonometric functions such as sine, cosine, tangent, cotangent, cosecant, and secant to calculate angles and length of sides; **AM.3.C**
- D. apply Heron's formula for finding areas of triangles when the height is not known; **AM.3.D**
- E. determine how changing dimensions will affect the perimeter, area, surface area, or volume in a project; **AM.3.E**
- F. determine how angles will affect structural strength and stability; **AM.3.F**
- G. apply right triangle relationships using the Pythagorean Theorem, special right triangles, and trigonometry for roof construction, building the frame of a car, or calculating machined parts; **AM.3.G**
- H. determine the materials needed for a job or project by finding missing parts of a circle; **AM.3.H**
- I. draw orthographic and isometric views and use them to produce engineering drawings; **AM.3.I**

- J. use cross-sections, including conic sections, of three-dimensional figures to relate to plane figures in specific detail on an engineered drawing; and **AM.3.J**
  - K. explain and use auxiliary views, revolutions, intersections, and engineered drawings. **AM.3.K**
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**4. The student applies measurement to all aspects of business and industry occupations. The student is expected to:** **AM.4**

- A. use dimensional analysis to select an appropriate tool to make measurements; **AM.4.A**
  - B. apply accurate readings of both U.S. customary and metric measuring devices to a problem situation; **AM.4.B**
  - C. square, measure, and cut materials to specified dimensions; **AM.4.C**
  - D. draw segments to scale using an accurate scale and measure segments that are drawn to scales; **AM.4.D**
  - E. convert temperature values between Celsius and Fahrenheit in situations involving thermodynamics; and **AM.4.E**
  - F. determine length, distance, area, surface area, volume, and weight with appropriate unit labels. **AM.4.F**
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**5. The student uses mathematical processes with graphical and numerical techniques to study patterns and analyze data related to finance. The student is expected to:** **AM.5**

- A. use rates and linear functions to solve problems involving finance and budgeting, including compensations and deductions; **AM.5.A**
  - B. solve problems related to local, state, and federal taxes; **AM.5.B**
  - C. analyze data to make decisions about banking and finance; **AM.5.C**
  - D. use mathematical processes with algebraic formulas, numerical techniques, and graphs to solve problems related to job cost analysis; **AM.5.D**
  - E. identify what parameters to change such as cost of materials, cost of labor, and work time required to improve the overall cost of a project; and **AM.5.E**
  - F. identify the most reasonable mathematical solution using estimation. **AM.5.F**
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**6. The student applies mathematical processes to design a study and use graphical, numerical, and analytical techniques to communicate the results. The student is expected to:** **AM.6**

- A. interpret and present situations in terms of given graphs and that fit graphics; **AM.6.A**
- B. apply Ohm's Law and Kirchhoff's laws to troubleshoot electrical circuits; **AM.6.B**
- C. collect and organize data; make and interpret scatterplots; and model, predict, and make decisions and critical judgments; and **AM.6.C**
- D. prepare technical reports and presentations with visual media or models, including tables, graphs, and verbal descriptions. **AM.6.D**

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**7. The student applies mathematical principles of manufacturing processes. The student is expected to:** AM.7

- A. identify the line types used on engineering drawings; AM.7.A
  - B. identify selected symbols commonly used on engineering drawings; AM.7.B
  - C. identify the components of engineering drawings; AM.7.C
  - D. read, interpret, and create engineering drawings; and AM.7.D
  - E. use proper nomenclature when identifying engineering or manufacturing processes. AM.7.E
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**Career Preparation I**

**1. The student demonstrates professional employability skills to gain an entry-level position. The student is expected to:** CP1.1

- A. identify employment opportunities; CP1.1.A
  - B. demonstrate the application of essential workplace knowledge and skills; CP1.1.B
  - C. develop a resume; CP1.1.C
  - D. demonstrate proper interview techniques in various situations; and CP1.1.D
  - E. create and complete appropriate documents such as electronic portfolio, employment application, letter of intent, I-9 form, W-4 form, and thank you letters. CP1.1.E
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**2. The student develops skills for success in the workplace. The student is expected to:** CP1.2

- A. identify and model appropriate grooming and appearance for the workplace; CP1.2.A
  - B. demonstrate dependability, punctuality, and initiative; CP1.2.B
  - C. research positive interpersonal skills, including respect for diversity; CP1.2.C
  - D. model appropriate business and personal etiquette in the workplace; CP1.2.D
  - E. exhibit productive work habits, ethical practices, and a positive attitude; CP1.2.E
  - F. demonstrate the ability to work with other employees to support the organization and complete assigned tasks; CP1.2.F
  - G. identify how to prioritize work to fulfill responsibilities and meet deadlines; CP1.2.G
  - H. evaluate the relationship of good physical and mental health to job success and personal achievement; CP1.2.H
  - I. demonstrate effective methods to secure, maintain, and terminate employment; and CP1.2.I
  - J. develop soft skills in a working environment. CP1.2.J
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**3. The student discusses work ethics, employer expectations, interactions with diverse populations, and communication skills in the workplace. The student is expected to:** CP1.3

- A. illustrate how personal integrity affects human relations on the job; CP1.3.A
  - B. research characteristics of successful working relationships such as teamwork, conflict resolution, self-control, and ability to accept criticism; CP1.3.B
  - C. discuss and analyze employer expectations; CP1.3.C
  - D. demonstrate respect for the rights of others; CP1.3.D
  - E. develop listening skills; CP1.3.E
  - F. apply effective listening skills used in the workplace; CP1.3.F
  - G. identify ethical standards; and CP1.3.G
  - H. comply with organizational policies and procedures. CP1.3.H
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**4. The student applies academic skills to the workplace. The student is expected to:** CP1.4

- A. apply mathematical skills to business transactions; CP1.4.A
  - B. develop a personal budget based on a career choice; CP1.4.B
  - C. interpret data from tables, charts, and graphs to estimate and find solutions to problems; and CP1.4.C
  - D. organize, write, and compile workplace business documents. CP1.4.D
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**5. The student applies the ethical code of conduct and legal responsibilities within the workplace. The student is expected to:** CP1.5

- A. research and compare published workplace policies and procedures; CP1.5.A
  - B. demonstrate responsible and ethical behavior; CP1.5.B
  - C. summarize provisions of the Fair Labor Standards Act; CP1.5.C
  - D. describe the consequences of "breach of confidentiality"; and CP1.5.D
  - E. research and describe laws related to different careers. CP1.5.E
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**6. The student applies the use of self-development techniques and interpersonal skills. The student is expected to:** CP1.6

- A. identify and practice effective interpersonal and team-building skills with coworkers, managers, and customers; and CP1.6.A
  - B. develop effective leadership skills through participation in activities such as career and technical student organizations. CP1.6.B
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**7. The student applies concepts and skills related to safety in the workplace. The student is expected to:** CP1.7

- A. identify and apply safe working practices related to the workplace; CP1.7.A
- B. demonstrate knowledge of personal and occupational safety practices in the workplace; CP1.7.B
- C. offer solutions related to unsafe work practices and attitudes; CP1.7.C

- D. explain Occupational Safety and Health Administration regulations in the workplace; and CP1.7.D
  - E. determine health and wellness practices that influence job performance. CP1.7.E
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**8. The student evaluates personal attitudes and work habits that support career retention and advancement. The student is expected to:** CP1.8

- A. analyze the future employment outlook in the occupational area; CP1.8.A
  - B. describe entrepreneurial opportunities in the occupational area; CP1.8.B
  - C. compare rewards and demands for various levels of employment in a variety of careers; CP1.8.C
  - D. evaluate strategies for career retention and advancement in response to the changing global workplace; CP1.8.D
  - E. summarize the rights and responsibilities of employers and employees; and CP1.8.E
  - F. determine effective money-management and financial-planning techniques. CP1.8.F
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**9. The student identifies skills and attributes necessary for professional advancement. The student is expected to:** CP1.9

- A. evaluate and compare employment options, including salaries and benefits; CP1.9.A
  - B. determine how interests, abilities, personal priorities, and family responsibilities affect career choices; and CP1.9.B
  - C. determine continuing education opportunities that enhance career advancement and promote lifelong learning. CP1.9.C
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**Career Preparation II**

**1. The student uses and evaluates employability skills to improve marketability within the workplace. The student is expected to:** CP2.1

- A. refine a professional electronic portfolio such as a two- to four-year individual career plan of study, resume, cover letter, awards, commendations, and thank you letters; CP2.1.A
  - B. obtain letters of recommendation; CP2.1.B
  - C. expand personal communication skills; and CP2.1.C
  - D. refine interview skills. CP2.1.D
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**2. The student demonstrates professional employability skills as required by business and industry. The student is expected to:** CP2.2

- A. maintain appropriate grooming and appearance for the workplace; CP2.2.A
- B. demonstrate positive interpersonal skills, including respect for diversity; CP2.2.B
- C. demonstrate appropriate business and personal etiquette in the workplace; CP2.2.C

- D. exhibit productive work habits, attitudes, and ethical practices; CP2.2.D
  - E. evaluate consequences for breach of personal and occupational safety practices in the workplace; and CP2.2.E
  - F. prioritize work to fulfill responsibilities and meet deadlines. CP2.2.F
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**3. The student applies work ethics, job expectations, multicultural considerations, and communication skills in the workplace. The student is expected to:** CP2.3

- A. evaluate personal integrity and its effects on human relations in the workplace; CP2.3.A
  - B. evaluate characteristics of successful working relationships such as teamwork, conflict resolution, self-control, and the ability to accept criticism; CP2.3.B
  - C. recognize and appreciate diversity in the workplace; CP2.3.C
  - D. analyze employer expectations; CP2.3.D
  - E. exhibit productive work habits and attitudes; CP2.3.E
  - F. communicate effectively to a variety of audiences; CP2.3.F
  - G. analyze ethical standards; and CP2.3.G
  - H. comply with organizational policies and procedures. CP2.3.H
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**4. The student applies and enhances academic knowledge and skills in the workplace. The student is expected to:** CP2.4

- A. apply critical- and creative-thinking skills to solve complex problems; CP2.4.A
  - B. integrate mathematical concepts into business transactions; CP2.4.B
  - C. analyze and apply data from tables, charts, and graphs to find solutions to problems; CP2.4.C
  - D. apply effective listening skills used in the workplace; CP2.4.D
  - E. read and write technical reports and summaries; and CP2.4.E
  - F. apply effective verbal, nonverbal, written, and electronic communication skills. CP2.4.F
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**5. The student recognizes legal responsibilities of the workplace. The student is expected to:** CP2.5

- A. evaluate provisions of the Fair Labor Standards Act; CP2.5.A
  - B. analyze the legal consequences of "breach of confidentiality"; and CP2.5.B
  - C. research and describe laws governing the different professions. CP2.5.C
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**6. The student recognizes the dangers of identity theft. The student is expected to:** CP2.6

- A. identify various methods criminals use to obtain information; and CP2.6.A
- B. research how to avoid becoming a victim. CP2.6.B

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**7. The student applies the use of interpersonal skills to improve personal development. The student is expected to:** CP2.7

- A. evaluate effective interpersonal and team-building skills involving situations with coworkers, managers, and customers; and CP2.7.A
- B. participate in leadership and career-development activities. CP2.7.B

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**8. The student recognizes knowledge and skills related to safety in the workplace. The student is expected to:** CP2.8

- A. apply safe working practices to a training station; CP2.8.A
- B. evaluate unsafe work practices and attitudes; CP2.8.B
- C. evaluate the impact of Occupational Safety and Health Administration regulations in the workplace; CP2.8.C
- D. recognize the importance of applying safety rules in all situations; and CP2.8.D
- E. analyze health and wellness practices that influence job performance. CP2.8.E

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**9. The student acquires the academic and technical skills for future education and employment in high-skill, high-wage, or high-demand occupations. The student is expected to:** CP2.9

- A. research and identify current or emerging occupations; CP2.9.A
- B. analyze future employment outlook; CP2.9.B
- C. research entrepreneurial opportunities; CP2.9.C
- D. analyze rewards and demands for various levels of employment; CP2.9.D
- E. identify the academic and technical entry requirements for employment in various high-skill, high-wage, or high-demand occupations; CP2.9.E
- F. identify and pursue opportunities available in high school and postsecondary to acquire the necessary academic and technical skills for employment in high-skill, high-wage, or high-demand occupations; CP2.9.F
- G. evaluate the rights and responsibilities of employers and employees; and CP2.9.G
- H. apply money-management and financial-planning techniques. CP2.9.H

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**10. The student identifies skills and characteristics necessary for professional advancement. The student is expected to:** CP2.10

- A. evaluate and compare employment advancement options such as salaries, benefits, and prerequisites; CP2.10.A
- B. compare rewards and demands for various levels of employment in a variety of careers; CP2.10.B
- C. determine continuing education opportunities that enhance career advancement and promote lifelong learning; CP2.10.C
- D. determine preparation requirements for levels of employment in a variety of careers; CP2.10.D

- E. determine personal priorities such as interests, abilities, and family responsibilities affecting career choice; and CP2.10.E
  - F. demonstrate effective methods to secure, maintain, and terminate employment. CP2.10.F
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## Extended Career Preparation

### 1. The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to: EC.1

- A. participate in a paid work-based application of previously studied knowledge and skills related to career and technical education; EC.1.A
  - B. participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment; EC.1.B
  - C. demonstrate professional standards and personal qualities needed to be employable such as punctuality, initiative, and cooperation with increased fluency; EC.1.C
  - D. complete tasks with high standards to ensure delivery of quality products and services; EC.1.D
  - E. employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and EC.1.E
  - F. employ planning and time-management skills with increased fluency to enhance results and complete work tasks. EC.1.F
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### 2. The student implements advanced professional communications strategies. The student is expected to: EC.2

- A. apply appropriate content knowledge, technical concepts, and vocabulary with increased fluency when analyzing information and following directions; EC.2.A
  - B. demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner; EC.2.B
  - C. analyze, interpret, and effectively communicate information, data, and observations; EC.2.C
  - D. observe and interpret verbal and nonverbal cues and behaviors to enhance communication; EC.2.D
  - E. apply active listening skills to obtain and clarify information; and EC.2.E
  - F. employ effective internal and external communications to support work activities. EC.2.F
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### 3. The student applies concepts of critical thinking and problem solving. The student is expected to: EC.3

- A. employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions; EC.3.A
- B. analyze elements of a problem to develop creative and innovative solutions; and EC.3.B

- C. demonstrate the use of content, technical concepts, and vocabulary when analyzing information and following directions. EC.3.C
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**4. The student understands and applies proper safety techniques in the workplace. The student is expected to:** EC.4

- A. demonstrate an understanding of and consistently follow workplace safety rules and regulations; EC.4.A
  - B. demonstrate safe operation of tools and equipment used in the industry; EC.4.B
  - C. describe and perform hazard analysis; and EC.4.C
  - D. demonstrate knowledge of procedures for reporting and handling accidents and safety incidents. EC.4.D
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**5. The student understands the professional, ethical, and legal responsibilities as they relate to employment and the workplace. The student is expected to:** EC.5

- A. demonstrate a positive, productive work ethic by performing assigned tasks as directed; EC.5.A
  - B. apply ethical reasoning to a variety of situations in order to make ethical decisions; and EC.5.B
  - C. comply with all applicable rules, laws, and regulations in a consistent manner. EC.5.C
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**6. The student participates in a paid career preparation experience. The student is expected to:** EC.6

- A. conduct, document, and evaluate learning activities in a supervised employment experience; EC.6.A
- B. develop advanced technical knowledge and skills related to the student's occupational objective; EC.6.B
- C. demonstrate growth of technical skill competencies; EC.6.C
- D. evaluate strengths and weaknesses in technical skill proficiency; and EC.6.D
- E. collect representative work samples. EC.6.E