

Manufacturing Prototype (Team)

Content Area		21st-Century Life & Careers	
Standard		9.4 Career and Technical Education: All students who complete a career and technical education program will acquire academic and technical skills for careers in emerging and established professions that lead to technical skill proficiency, credentials, certificates, licenses, and/or degrees. (For descriptions of the 16 career clusters, see the Career Clusters Table .)	
Strand		O. Science, Technology, Engineering, & Mathematics Career Cluster	
By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
12	Academic Foundations: Academic concepts lay the foundation for the full range of career and postsecondary education opportunities within the career cluster.	9.4.12.O.1	Demonstrate language arts knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
		9.4.12.O.2	Demonstrate mathematics knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
		9.4.12.O.3	Demonstrate science knowledge and skills required to pursue the full range of postsecondary education and career opportunities.
	Communication Skills: All clusters rely on effective oral and written communication strategies for creating, expressing, and interpreting information and ideas that incorporate technical terminology and information.	9.4.12.O.4	Select and employ appropriate reading and communication strategies to learn and use technical concepts and vocabulary in practice.
		9.4.12.O.5	Demonstrate use of the concepts, strategies, and systems for obtaining and conveying ideas and information to enhance communication.
		9.4.12.O.6	Locate, organize, and reference written information from various sources to communicate with others.
		9.4.12.O.7	Evaluate and use information resources to accomplish specific occupational tasks.
		9.4.12.O.8	Use correct grammar, punctuation, and terminology to write and edit documents.
		9.4.12.O.9	Develop and deliver formal and informal presentations using appropriate media to engage and inform audiences.
		9.4.12.O.10	Interpret verbal and nonverbal cues/behaviors to enhance communication.
		9.4.12.O.11	Apply active listening skills to obtain and clarify information.
		9.4.12.O.12	Develop and interpret tables, charts, and figures to support written and oral communications.

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	9.4.12.O.13	Listen to and speak with diverse individuals to enhance communication skills.
	9.4.12.O.14	Exhibit public relations skills in order to increase internal and external customer satisfaction.
	9.4.12.O.15	Prepare science, technology, engineering, and mathematics material in oral, written, or visual formats to provide information to an intended audience and to fulfill the specific communication needs of that audience.
	9.4.12.O.16	Apply active listening skills to obtain or clarify information pertaining to plans, processes, projects, or designs.
Problem-Solving and Critical Thinking: Critical and creative thinking strategies facilitate innovation and problem-solving independently and in teams.	9.4.12.O.17	Employ critical thinking skills (e.g., analyze, synthesize, and evaluate) independently and in teams to solve problems and make decisions.
	9.4.12.O.18	Employ critical thinking and interpersonal skills to resolve conflicts.
	9.4.12.O.19	Identify, write, and monitor performance goals to guide progress in assigned areas of responsibility and accountability.
	9.4.12.O.20	Conduct technical research to gather information necessary for decision-making.
	9.4.12.O.21	Effectively develop and apply the skills inherent in systems engineering in which requirements, configuration, integration, project management, quality assurance, and process applications are necessary.
Information Technology Applications: Technology is used to access, manage, integrate, and disseminate information.	9.4.12.O.22	Employ technological tools to expedite workflow.
	9.4.12.O.23	Operate electronic mail applications to communicate.
	9.4.12.O.24	Operate Internet applications to perform tasks.
	9.4.12.O.25	Operate writing and publishing applications to prepare communications.
	9.4.12.O.26	Operate presentation applications to prepare and deliver presentations.
	9.4.12.O.27	Employ spreadsheet applications to organize and manipulate data.
	9.4.12.O.28	Employ database applications to manage data.
	9.4.12.O.29	Employ collaborative/groupware applications to facilitate group work.
	9.4.12.O.30	Employ computer operations applications to manage tasks.
	9.4.12.O.31	Use computer-based equipment (containing embedded computers or processors) to control devices.
	9.4.12.O.32	Effectively use information technology to gather, store, and communicate data in appropriate formats.

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	9.4.12.O.33	Evaluate and demonstrate skill with a range of technological tools designed to manipulate, report, or operate with data acquisition.
Systems: <ul style="list-style-type: none"> • Roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment impact business operations. • Key organizational systems impact organizational performance and the quality of products and services. • Understanding the global context of 21st-century industries and careers impacts business operations. 	9.4.12.O.34	Describe the nature and types of business organizations to build an understanding of the scope of organizations.
	9.4.12.O.35	Describe and use quality control systems and practices to ensure quality products and services.
	9.4.12.O.36	Examine and summarize roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment to understand the nature and scope of organizations in this cluster.
	9.4.12.O.37	Identify how key organizational systems affect organizational performance and the quality of products and services to demonstrate an understanding of how systems are managed and improved in this cluster.
Safety, Health, and Environment: Implementation of health, safety, and environmental management systems and organizational policies and procedures impacts organizational performance, regulatory compliance, and continuous improvement.	9.4.12.O.38	Demonstrate knowledge of personal and jobsite safety rules and regulations to maintain safe and healthful working conditions and environments.
	9.4.12.O.39	Demonstrate knowledge of employee rights and responsibilities and employers' obligations to maintain workplace safety and health.
	9.4.12.O.40	Identify emergency procedures that are necessary to provide aid in workplace accidents.
	9.4.12.O.41	Identify response techniques to create a disaster and/or emergency response plan.
	9.4.12.O.42	Explain health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
	9.4.12.O.43	Evaluate organizational policies and procedures that contribute to continuous improvement in performance and compliance.
	9.4.12.O.44	Apply appropriate safety practices in environments in this cluster to ensure a safe workplace.
	9.4.12.O.45	Develop an awareness of safety, health, and environmental hazards inherent in this cluster and apply appropriate precautions when solving problems, developing plans, implementing processes, or completing projects to proactively promote safety.
	Leadership and Teamwork: Effective leadership and	9.4.12.O.46

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teamwork strategies foster collaboration and cooperation between business units, business partners, and business associates toward the accomplishment of organizational goals.	9.4.12.O.47	Employ organizational skills to foster positive working relationships and accomplish organizational goals.
	9.4.12.O.48	Employ teamwork skills to achieve collective goals and use team members' talents effectively.
	9.4.12.O.49	Establish and maintain effective relationships in order to accomplish objectives and tasks.
	9.4.12.O.50	Conduct and participate in meetings to accomplish tasks.
	9.4.12.O.51	Employ mentoring skills to assist others.
Ethics and Legal Responsibilities: Legal responsibilities, professional ethics, and codes of conduct affect management practices, business performance, and regulatory compliance, as well as the confidence of customers, business partners, and investors.	9.4.12.O.52	Apply ethical reasoning to a variety of situations in order to make ethical decisions.
	9.4.12.O.53	Interpret and explain written organizational policies and procedures to help employees perform their jobs according to employer rules and expectations.
	9.4.12.O.54	Demonstrate workplace ethics specific to occupations in this cluster in order to reflect effective stewardship of resources.
Employability and Career Development: Employability skills and career and entrepreneurship opportunities build the capacity for successful careers in a global economy.	9.4.12.O.55	Identify and demonstrate positive work behaviors and personal qualities needed to succeed.
	9.4.12.O.56	Develop a Personalized Student Learning Plan to meet career goals and objectives.
	9.4.12.O.57	Demonstrate skills related to seeking and applying for employment in a desired job.
	9.4.12.O.58	Maintain a career portfolio to document knowledge, skills, and experience in a career field.
	9.4.12.O.59	Demonstrate skills in evaluating and comparing employment opportunities in order to accept employment positions that match career goals.
	9.4.12.O.60	Identify and exhibit traits for retaining employment.
	9.4.12.O.61	Identify and explore careers in one or more career pathways to build an understanding of the opportunities available in the cluster.
	9.4.12.O.62	Examine requirements for career advancement to plan for continuing education and training.
	9.4.12.O.63	Research professional development opportunities needed to keep current on relevant trends and information within the cluster.

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		9.4.12.O.64	Examine licensing, certification, and credentialing requirements at the national, state, and local levels to maintain compliance with industry requirements.
		9.4.12.O.65	Examine employment opportunities in entrepreneurship as an option for career planning.
		9.4.12.O.66	Select, research, and examine critical aspects of career opportunities in one or more pathways to gain an understanding of the breadth of occupations within this cluster.
	Technical Skills: Technical knowledge and skills play a role in all careers within the cluster and pathway.	9.4.12.O.67	Employ information management techniques and strategies to assist in decision-making.
		9.4.12.O.68	Employ planning and time management skills and tools to enhance results and complete work tasks.

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Pathway	(1) Engineering & Technology		
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12	Academic Foundations: Academic concepts lay the foundation for the full range of career and postsecondary education opportunities within the career cluster.	9.4.12.O(1).1	Apply the concepts, processes, guiding principles, and standards of school mathematics to solve science, technology, engineering, and mathematics problems.
		9.4.12.O(1).2	Apply and use algebraic, geometric, and trigonometric relationships, characteristics, and properties to solve problems.
		9.4.12.O(1).3	Demonstrate the ability to select, apply, and convert systems of measurement to solve problems.
		9.4.12.O(1).4	Demonstrate the ability to use Newton’s laws of motion to analyze static and dynamic systems with and without the presence of external forces.
		9.4.12.O(1).5	Explain relevant physical properties of materials used in engineering and technology.
		9.4.12.O(1).6	Explain relationships among specific scientific theories, principles, and laws that apply to technology and engineering.
	Problem-Solving and Critical Thinking: Critical and creative thinking strategies facilitate innovation and problem-solving independently and in teams.	9.4.12.O(1).7	Use mathematics, science, and technology concepts and processes to solve problems in projects involving design and/or production (e.g., medical, agricultural, biotechnological, energy and power, information and communication, transportation, manufacturing, and construction).
	Information Technology Applications: Technology is used to access, manage, integrate, and disseminate information.	9.4.12.O(1).8	Select and use a range of communications technologies, including word processing, spreadsheet, database, presentation, email, and Internet applications, to locate and display information.
	Technical Skills: Technical knowledge and skills play a role in all careers within the cluster and pathway.	9.4.12.O(1).9	Employ concepts and processes for the application of technology to engineering.
		9.4.12.O(1).10	Model technical competence by developing processes and concepts for using different technologies.

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		9.4.12.O(1).11	Demonstrate understanding of processes and concepts that are key to understanding the design process.
		9.4.12.O(1).12	Model technical competence by developing and applying processes and concepts in the design process.

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Strand	O. Science, Technology, Engineering, & Mathematics Career Cluster		
Pathway	(2) Science & Mathematics		
By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
12	Academic Foundations: Academic concepts lay the foundation for the full range of career and postsecondary education opportunities within the career cluster.	9.4.12.O(2).1	Develop an understanding of how science and mathematics function to provide results, answers, and algorithms for engineering activities to solve problems and issues in the real world.
		9.4.12.O(2).2	Apply science and mathematics when developing plans, processes, and projects to find solutions to real world problems.
		9.4.12.O(2).3	Assess the impact that science and mathematics have on society when used to develop projects or products.
	Problem-Solving and Critical Thinking: Critical and creative thinking strategies facilitate innovation and problem-solving independently and in teams.	9.4.12.O(2).4	Use scientific and mathematical problem-solving skills and abilities to develop realistic solutions to assigned projects, and illustrate how science and mathematics impact problem-solving in modern society.
		9.4.12.O(2).5	Demonstrate critical thinking abilities and skills needed to review information, to explain statistical analyses, and to translate, interpret, and summarize research and statistical data collected and analyzed as the result of an investigation.
	Technical Skills: Technical knowledge and skills play a role in all careers within the cluster and pathway.	9.4.12.O(2).6	Demonstrate the knowledge and technical skills needed to obtain and succeed in a chosen scientific and mathematical field.