

Statewide Framework Document for: 011001

Food Science and Safety

Standards may be added to this document prior to submission but may not be removed from the framework to meet state credit equivalency requirements. Performance assessments may be developed at the local level. In order to earn state approval, performance assessments must be submitted within this framework. **This course is eligible for 1 credit of laboratory science.** The Washington State Science Standards performance expectations for high school blend core ideas (Disciplinary Core Ideas, or DCIs) with scientific and engineering practices (SEPs) and crosscutting concepts (CCCs) to support students in developing usable knowledge that can be applied across the science disciplines. These courses are to be taught in a [three-dimensional manner](#). The details about each performance expectation can be found at [Next Generation Science Standards](#), and the supporting evidence statements can be found under [Resources](#).

School District Name	
Course Title: Food Science and Safety	Total Framework Hours: 180
CIP Code: 011001 <input type="checkbox"/> Exploratory <input checked="" type="checkbox"/> Preparatory	Date Last Modified: December 30, 2020
Career Cluster: Agriculture, Food and Natural Resources	Cluster Pathway: Food Products and Processing
Course Summary: Food Science is a course that focuses on the application of biological, chemical, and physical principles to the study of converting raw agricultural products into processed forms suitable for direct human consumption, and the storage of such products. Includes instruction in applicable aspects of the agricultural sciences, human physiology and nutrition, food chemistry, agricultural products processing, food additives, food preparation and packaging, food storage and shipment, and related aspects of human health and safety including toxicology and pathology. As with all agriculture courses, instruction and assessment in the Supervised Agriculture Experience (SAE) is a requirement. The Supervised Agriculture Experience includes placing a student in a position where he or she will learn the practices of entrepreneurship and the fundamentals of research and experimentation in the agricultural field. Participants in the SAE will conduct exploratory projects with the purpose of learning about and improving practices in their surroundings. SAE.01. This course will include instruction in and Student involvement in Supervised Agriculture Experience Projects (SAE).	
Eligible for Equivalent Credit in: Science	Total Number of Units: 7

Unit 1: Introduction to Food Science**Total Learning Hours for Unit: 20****Unit Summary:**

This unit will include instruction in food science, science, and safety and inquiry.

- 1.1 Sensory properties of food influence consumer preference and acceptance.
- 1.2 Organization and record keeping are important to success in food science.
- 1.3 Discoveries about food have driven advances in food processing and preservation.
- 1.4 Good laboratory procedures and safety ensure the quality and integrity of laboratory data.
- 1.5 Sanitation and cleanliness are critical for safety in food handling and preparation
- 1.6 Foods are chemical systems comprised of lipids, simple and complex carbohydrates, proteins, vitamins and other molecules
- 1.7 Rigorous, scientific research methods, including qualitative and quantitative analysis, are standard in the food industry.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Observe and identify three common foods using the five senses.
- Determine acceptability and preference of foods using sensory evaluation.
- Develop and keep an Agriscience Notebook to record and store information
- Develop a Laboratory Notebook to record observations and protocols.
- Work collaboratively to develop a timeline of food science discoveries
- Determine the date and significance of a food science discovery, scientist, organization, and/or event.
- Diagram and describe where emergency equipment and safety hazards in the food science laboratory are located
- Compare different methods of washing hands, workspace, and utensils, and determine which method is best.
- Research the main nutrients from food needed in the human body.
- Detect nutrients, such as protein, starch, sugar, fat, and vitamin C, using indicator solutions.
- Investigate the presence of nutrients in unknown food sources using scientific inquiry and the scientific method.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Students collaborate and work creatively with others to develop a timeline of food science discoveries.
- Students access and evaluate information and work independently to observe and identify food utilizing their senses.
- Students are responsible to others while learning about safety and emergency equipment related to food science.

Industry Standards and/or Competencies:**Agriculture, Food, and Natural Resources (AFNR) Standards -**

FPP.02: Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

FPP.02.01: Apply principles of nutrition and biology to develop food products that provide a safe, wholesome and nutritious food supply for local and global food systems

FPP.02.03: Apply principles of human behavior to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

FPP.04.02: Evaluate the significance and implications of changes and trends in the food products and processing industry in the local and global food systems.

CRP.07: Employ valid and reliable research strategies.

CRP.07.01: Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.

CS.03: Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.

CS.03.04: Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

Aligned Washington State Academic Standards

Science	HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking Questions and Defining Problems Planning and Carrying Out Investigations Analyzing and Interpreting Data Obtaining, Evaluating, and Communicating Information	LS1.B. Growth and Development of Organisms	Structure and Function Cause and Effect: Mechanism and Prediction Systems and System Models Structure and Function

Unit 2: Food Chemistry

Total Learning Hours for Unit: 40

Unit Summary:

This unit will include instruction on the Influence of Nutrients in Food, Food Chemists, and Factors of Change.

- 1.1 The amounts of lipids, carbohydrates, proteins, and water in a food product influence sensory characteristics.
- 1.2 Ingredients have varying functionalities in food products.
- 1.3 Different ingredients can be used to produce the same product.
- 1.4 Food is constantly reacting with its environment.
- 1.5 Foods change over time due to chemical reactions, physical changes, microbiological growth and/or enzymatic activity.

1.6 pH is an essential solution property that influences chemical reactions, properties, quality, and safety of food.

1.7 Physical changes can cause foods to crystallize, gel, and otherwise change over time.

1.8 Chemical reactions, such as Maillard browning and oxidation, can change food over time because food is a non-equilibrium system.

1.9 pH influences the way a food reacts chemically as well as the sensory characteristics.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Conduct sensory evaluations to ascertain how the amount of lipid, carbohydrates, proteins, and water affect sensory characteristics of food.
- Examine properties and sensory characteristics of various starches for the ability to withstand time and temperature changes.
- Render fat from assorted meat products to determine the amount of lipids present.
- Dehydrate hotdogs and deli ham to determine the percentage of water in each food product.
- Examine elasticity of gluten in different flours.
- Research and determine the functions of ingredients in a basic cake recipe.
- Substitute ingredients in a recipe and use sensory analysis to determine acceptance of substitute ingredients.
- Observe foods of various ages to determine changes that have occurred over time.
- Culture swabs taken from food samples to determine the presence of microorganisms.
- Prepare a bread recipe and observe changes to the ingredients that occur during the mixing and baking of the bread.
- Determine the pH of common pantry ingredients and the functions of those ingredients in foods.
- Research and present findings on common physical changes in food.
- Demonstrate how to produce common physical changes in food.
- Evaluate effects of storage of food products on Maillard browning.
- Conduct a sensory evaluation to determine the amount of change in a food product over time.
- Measure the amount of CO₂ gas produced in a chemical reaction with varying pH levels.
- Conduct a sensory evaluation difference test to determine if there is a difference in the taste of low acid orange juice compared to regular orange juice.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Students work effectively in diverse teams, collaborate with others, and adapt to change while completing food science labs and observations.
- Students solve problems, make judgements and decisions, and reason effectively while completing culture swabs, pH tests, and sensory characteristics of food.

Industry Standards and/or Competencies:

CRP.02.01: Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.

CRP.04.01: Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.

CRP.04.02: Produce clear, reasoned and coherent written and visual communication in formal and informal settings.

CRP.07.01: Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.

CRP.12.01: Contribute to team-oriented projects and builds consensus to accomplish results using cultural global competence in the workplace and community.

CS.03.03: Apply health and safety practices to AFNR workplaces.

CS.03.04: Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

CS.03.04: Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

FPP.02: Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

FPP.02.02: Apply principles of microbiology and chemistry to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

FPP.02.03: Apply principles of human behavior to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

Aligned Washington State Academic Standards		
Science	Washington Science Standards (Next Generation Science Standards): HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium. HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects).	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking Questions and Defining Problems Analyzing and Interpreting Data	PS1B Chemical Reactions PS2B Types of Interactions	Patterns Cause and Effect: Mechanism and Prediction Structure and Function Stability and Change

Unit 3: Safety of Our Food	Total Learning Hours for Unit: 25
Unit Summary: This unit will include instruction in good manufacturing practices, ABCs of Food Safety, and Pathogen Pathways.	

- 1.1 Personal hygiene is a critical GMP that is easily controlled
- 1.2 Good manufacturing practices can promote safe preparation and handling of food.
- 1.3 Allergens are food safety concerns and need to be addressed with proper food preparation and handling.
- 1.4 HACCP utilizes seven basic principles to assure potentially hazardous products do not reach the consumer.
- 1.5 HACCP concepts are used in all phases of food production and processing.
- 1.6 HACCP is a framework for assessing and/or preventing risks associated with physical, chemical, and biological hazards in food design and manufacturing systems.
- 1.7 Microbiological organisms can have positive and negative effects on foods and people.
- 1.8 Microbial growth can be manipulated using temperature, pH, water activity, competitive exclusion, and chemical agents.
- 1.9 Pathogens can cause illness or death when present in food.

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Develop a sign, for display, outlining proper protocols for a personal hygiene topic and present information to class.
- Observe photographs of food science situations to determine what GMPs are being followed and identify those that are not.
- Prepare foods using different sanitation methods and test for cross contamination.
- Research the principles of a HACCP plan and develop a Prezi presentation and handout to be used as an informational resource for other students.
- Determine the HACCP principle explained in a scenario and justify the reasoning for that choice.
- Collaborate as a team and follow steps to develop a HACCP plan for ham and cheese sandwiches.
- Research bacteria, mold, and yeast and record growth factors, appearance, and inhibiting methods.
- Prepare agar for microbial growth and inoculate the agar with yeast.
- Develop and conduct a protocol testing factors affecting microbial growth.
- Write a laboratory report discussing findings and analyzing results of tests conducted.
- Research foodborne pathogens to discover diseases pathogens can cause and prevention methods to control pathogens.
- Develop a comic strip depicting the information discovered about an assigned pathogen.
- Collaborate with peers to determine possible pathogens that caused sickness in a role-play activity.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Students use and manage information and apply technology effectively while preparing agar for experiments.
- Students are self-directed learners and use and manage information while writing a laboratory report.

Industry Standards and/or Competencies:

Agriculture, Food, and Natural Resources (AFNR) Standards -

- CRP.02.01: Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.
- CRP.02.02: Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.
- CRP.04.01: Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.

CRP.04.02: Produce clear, reasoned and coherent written and visual communication in formal and informal settings.

CRP.04.03: Model active listening strategies when interacting with others in formal and informal settings.

CRP.07.01: Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.

CRP.07.02: Evaluate the validity of sources and data used when considering the adoption of new technologies, practices and ideas in the workplace and community.

CRP.08.02: Investigate, prioritize and select solutions to solve problems in the workplace and community.

CRP.12.01: Contribute to team-oriented projects and builds consensus to accomplish results using cultural global competence in the workplace and community.

CS.03.01: Identify and explain the implications of required regulations to maintain and improve safety, health and environmental management systems.

CS.03.02: Develop and implement a plan to maintain and improve health, safety and environmental compliance and performance.

CS.03.03: Apply health and safety practices to AFNR workplaces.

CS.03.04: Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

BS.02: Demonstrate proficiency by safely applying appropriate laboratory skills to complete tasks in a biotechnology research and development environment (e.g., standard operating procedures, record keeping, aseptic technique, equipment maintenance, etc.).

BS.03: Demonstrate the application of biotechnology to solve problems in AFNR systems (e.g., bioengineering, food processing, waste management, horticulture, forestry, livestock, crops, etc.).

BS.02.05: Examine and perform scientific procedures using microbes, DNA, RNA and proteins in a laboratory.

BS.03: Demonstrate the application of biotechnology to solve problems in AFNR systems (e.g., bioengineering, food processing, waste management, horticulture, forestry, livestock, crops, etc.).

BS.03.02: Apply biotechnology principles, techniques and processes to enhance the production of food through the use of microorganisms and enzymes.

FPP.01: Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.

FPP.01.01: Analyze and manage operational and safety procedures in food products and processing facilities.

FPP.01.02: Apply food safety and sanitation procedures in the handling and processing of food products to ensure food quality.

FPP.02: Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

FPP.02.02: Apply principles of microbiology and chemistry to develop food products to provide a safe, wholesome, and nutritious food supply for local and global food systems.

FPP.03: Select and process food products for storage, distribution and consumption.

FPP.03.01: Implement selection, evaluation and inspection techniques to ensure safe and quality food products.

FPP.04: Explain the scope of the food industry and the historical and current developments of food product and processing.

FPP.04.03: Identify and explain the purpose of industry organizations, groups and regulatory agencies that influence the local and global food systems.

Aligned Washington State Academic Standards	
Science	HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

	<p>HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.</p> <p>HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.</p> <p>HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering</p> <p>HS- ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.</p>	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking Questions and Defining Problems Developing and Using Models Analyzing and Interpreting Data Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information Planning and Carrying Out Investigations Constructing Explanations and Designing Solutions	ETS1. A Defining and Delimiting Engineering Problems ETS1.B Developing Possible Solutions ETS1.C Optimizing the Design Solution LS1.A Structure and Function	Patterns Cause and Effect: Mechanism and Prediction Systems and System Models Structure and Function

Unit 4: Food Processing Preservation and Packaging	Total Learning Hours for Unit: 25
<p>Unit Summary:</p> <p>This unit will include instruction on Processing and Consumption, Processing for Preservation, Processing for Quality and Safety.</p> <p>4.1 Processing is a system that physically or chemically changes the inherent characteristics of agricultural products prior to consumption.</p> <p>4.2 Specific unit operations are dependent upon the chemical and physical properties of the raw food commodity.</p> <p>4.3 Processing methods are dependent upon the end uses of the agricultural products.</p> <p>4.4 Agricultural commodities are processed and separated into components used for further processing or for consumption.</p> <p>4.5 The five basic food-processing principles that achieve preservation are moisture removal, heat treatment, low-temperature treatment, acidity control, and non-thermal processes.</p> <p>4.6 Food preservation controls microbial growth and enzymatic reactions, extending the shelf life of a food while changing its quality and usability.</p> <p>4.7 A variety of federal, state, and local agencies govern the manufacture and sale of food.</p> <p>4.8 Agricultural commodities are graded based on their quality and usability, triggering some food products to have quality grading standards.</p> <p>4.9 Certain food products must meet legal standards of identity</p>	

Performance Assessments: (Districts to complete for each unit)

Example assessments for this unit include:

- Identify chemical and physical changes of strawberries, cream, and other ingredients while processing raw products into food products for consumption.
- Generate a list of chemical and physical properties of apples and apple products.
- Identify unit operations used to process apples.
- Determine how physical and chemical properties of food affect unit operations.
- Evaluate how processing methods affect the quality of strawberries and test which processed strawberry would better replace fresh strawberries in a recipe.
- Investigate methods used in processing poultry and determine what products can be derived from a raw commodity.
- Process a chicken into as many different food products as possible.
- Evaluate microbial growth of buttermilk and heat-treated buttermilk.
- Manipulate pH levels of apples to inactivate enzymatic reactions and extend shelf life.
- Remove water from fruit to study the effects of water on microbes.
- Observe rate of deterioration of food products at room temperature, refrigeration, and freezing.
- Assess sensory characteristics of food products after processing.
- Examine non-thermal processing methods in the food science industry and write a technical research paper on non-thermal processing methods.
- Evaluate differences of minimally processed food products to processed food products and develop a conclusion statement on the effects of processing on food products.
- Research regulatory agencies and the laws that they regulate.
- Determine which agency is responsible for regulating specific food products.
- Grade tomato catsup in accordance to USDA quality grading standards.
- Evaluate milk samples to determine if the product has been adulterated and types of adulterants.

Leadership Alignment: (Districts to complete for each unit)

Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.

Example:

- Students think creatively and work creatively with others to research regulatory agencies.
- Students make judgments and decisions and solve problems while evaluating processing methods.

Industry Standards and/or Competencies:

Agriculture, Food, and Natural Resources (AFNR) Standards -

CRP.02.01: Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.

CRP.02.02: Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.

CRP.04.02: Produce clear, reasoned and coherent written and visual communication in formal and informal settings.

CRP.06.01: Synthesize information, knowledge and experience to generate original ideas and challenge assumptions in the workplace and community.

CRP.06.03: Create and execute a plan of action to act upon new ideas and introduce innovations to workplace and community organizations.

CRP.07.01: Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.

CRP.07.02: Evaluate the validity of sources and data used when considering the adoption of new technologies, practices and ideas in the workplace and community.

CRP.08.02: Investigate, prioritize and select solutions to solve problems in the workplace and community.

CRP.11.01: Research, select and use new technologies, tools and applications to maximize productivity in the workplace and community.

CRP.12.01: Contribute to team-oriented projects and builds consensus to accomplish results using cultural global competence in the workplace and community.

CS.03.03: Apply health and safety practices to AFNR workplaces.

CS.03.04: Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.

FPP.01: Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.

FPP.01.02: Apply food safety and sanitation procedures in the handling and processing of food products to ensure food quality.

FPP.01.03: Apply food safety procedures when storing food products to ensure food quality.

FPP.02: Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

FPP.02.02: Apply principles of microbiology and chemistry to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

FPP.02.03: Apply principles of human behavior to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

FPP.03: Select and process food products for storage, distribution and consumption.

FPP.03.01: Implement selection, evaluation and inspection techniques to ensure safe and quality food products.

FPP.03.02: Design and apply techniques of food processing, preservation, packaging and presentation for distribution and consumption of food products.

FPP.04: Explain the scope of the food industry and the historical and current developments of food product and processing.

FPP.04.03: Identify and explain the purpose of industry organizations, groups and regulatory agencies that influence the local and global food systems.

Aligned Washington State Academic Standards		
Science	Washington Science Standards (Next Generation Science Standards): HS-PS1-5: Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs HS-PS1-6: refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking Questions and Defining Problems Constructing Explanations and Designing Solutions Analyzing and Interpreting Data Planning and Carrying Out Investigations Obtaining, Evaluating, and Communicating Information	PS1. B Chemical Reactions	Stability and Change Cause and Effect: Mechanism and Prediction Systems and System Models Structure and Function Patterns

Unit 5: Food Health and Security	Total Learning Hours for Unit: 20
<p>Unit Summary: The unit will include instruction Nourishing Nutrition Labels, Safe, Secure, and Accessible.</p> <p>5.1 Food labels provide required and useful information, such as ingredients, nutrition, claims, traceability, warnings, and proper food handling for consumers.</p> <p>5.2 Recommended dietary allowances provide guidelines for proper intake of macromolecules for health depending upon gender and different life stages.</p> <p>5.3 Foods are analyzed and labeled based on their composition of various molecules.</p> <p>5.4 Safe and nutritious food, necessary to maintain health, is not equally accessible to everyone.</p> <p>5.5 U.S. food supply needs protection from intentional adulteration.</p>	
<p>Performance Assessments: (Districts to complete for each unit)</p> <p><i>Example assessments for this unit include:</i></p> <ul style="list-style-type: none"> • Dissect a nutrition label and examine each part to learn how to use a label to help consume a balanced diet. • Investigate a food label to determine how to find required information and consumer warnings. • Determine recommended dietary guidelines for a specific set of individuals and develop a menu that contains the necessary nutrients for a healthy diet. • Recommend alternative foods for individuals with dietary restrictions. • Research ingredients in a recipe to determine nutrient contents of each ingredient and develop a nutrition panel for the food product produced by the recipe. • Analyze statistics about food insecurity in the United States and their community. • Develop solutions to possible situations of food insecurity in their community. • Evaluate vulnerabilities toward intentional adulteration of a packing plant in the United States. • Develop a food defense plan. • Consider possible ways to attack the food supply. 	
<p>Leadership Alignment: (Districts to complete for each unit)</p> <p><i>Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.</i></p> <p><i>Example:</i></p> <ul style="list-style-type: none"> • Students access and evaluate information utilizing food labels. 	
<p>Industry Standards and/or Competencies:</p> <p>Agriculture, Food, and Natural Resources (AFNR) Standards -</p> <p>CRP.02.01: Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.</p> <p>CRP.04.01: Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.</p> <p>CRP.04.02: Produce clear, reasoned and coherent written and visual communication in formal and informal settings.</p> <p>CRP.04.03: Model active listening strategies when interacting with others in formal and informal settings.</p>	

CRP.05.02: Make, defend and evaluate decisions at work and in the community using information about the potential environmental, social and economic impacts.

CRP.06.01: Synthesize information, knowledge and experience to generate original ideas and challenge assumptions in the workplace and community.

CRP.06.02: Assess a variety of workplace and community situations to identify ways to add value and improve the efficiency of processes and procedures.

CRP.06.03: Create and execute a plan of action to act upon new ideas and introduce innovations to workplace and community organizations.

CRP.08.02: Investigate, prioritize and select solutions to solve problems in the workplace and community.

CRP.08.03: Establish plans to solve workplace and community problems and execute them with resiliency.

CRP.12.01: Contribute to team-oriented projects and builds consensus to accomplish results using cultural global competence in the workplace and community.

CS.01.01: Research, examine and discuss issues and trends that impact AFNR systems on local, state, national and global levels.

CS.03.02: Develop and implement a plan to maintain and improve health, safety and environmental compliance and performance.

FPP.01: Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.

FPP.01.01: Analyze and manage operational and safety procedures in food products and processing facilities.

FPP.02: Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

FPP.02.01: Apply principles of nutrition and biology to develop food products that provide a safe, wholesome and nutritious food supply for local and global food systems.

FPP.04: Explain the scope of the food industry and the historical and current developments of food product and processing.

FPP.04.02: Evaluate the significance and implications of changes and trends in the food products and processing industry in the local and global food systems.

Aligned Washington State Academic Standards

<p>Science</p>	<p>Washington Science Standards (Next Generation Science Standards):</p> <p>HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.</p> <p>HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.</p> <p>HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.</p> <p>HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.</p> <p>HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.</p>
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	<p>HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.</p> <p>HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.</p> <p>HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.</p>	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

Unit 6: Preference and Product Availability	Total Learning Hours for Unit: 25
<p>Unit Summary: This unit will include instruction in Consumer Preferences, To Protect and Sell.</p> <p>6.1 Consumers choose food based on lifestyle factors including price, availability, convenience, culture, and nutrition.</p> <p>6.2 Sensory evaluations must be carefully constructed and executed to reduce factors or biases that are not relevant to the test objective.</p> <p>6.3 Different sensory evaluation techniques determine consumer preference and acceptance.</p> <p>6.4 Food marketing uses technology and media to influence consumer behavior.</p> <p>6.5 Food packaging both protects food and attracts consumers.</p> <p>6.6 Food retailers position products based on shopping behaviors and consumer trends.</p>	
<p>Performance Assessments: (Districts to complete for each unit)</p> <p><i>Example assessments for this unit include:</i></p> <ul style="list-style-type: none"> • Evaluate a menu and consider choices based on nutrition, price, convenience, and culture. • Choose food products based on lifestyle. Participate in sensory evaluation modeling factors to identify biases. • Discuss how non-relevant factors can manipulate the perception of panelists. • Construct and conduct a specific sensory evaluation and collect data to analyze the outcome of the evaluation. • Develop an instructional guide explaining the steps and key points of a specific sensory evaluation. • Compare different advertisements and determine how the marketer addressed product, price, place, and promotion. • Develop a food package to withstand a crush test, a drop test, and a water test while identifying the product and attracting consumers. • Evaluate a store or market selling an assigned food product and evaluate the planogram and how the retailer marketed the product. 	
<p>Leadership Alignment: (Districts to complete for each unit)</p> <p><i>Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.</i></p> <p><i>Example:</i></p> <ul style="list-style-type: none"> • Students communicate clearly and work effectively in diverse teams to evaluate marketing strategies. 	
<p>Industry Standards and/or Competencies: Agriculture, Food, and Natural Resources (AFNR) Standards -</p>	

CRP.02.01: Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.

CRP.02.02: Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.

CRP.04.01: Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.

CRP.04.02: Produce clear, reasoned and coherent written and visual communication in formal and informal settings.

CRP.04.03: Model active listening strategies when interacting with others in formal and informal settings.

CRP.06.03: Create and execute a plan of action to act upon new ideas and introduce innovations to workplace and community organizations.

CRP.08.02: Investigate, prioritize and select solutions to solve problems in the workplace and community.

CRP.12.01: Contribute to team-oriented projects and builds consensus to accomplish results using cultural global competence in the workplace and community.

CS.01.01: Research, examine and discuss issues and trends that impact AFNR systems on local, state, national and global levels.

FPP.02: Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.

FPP.02.03: Apply principles of human behavior to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

FPP.03: Select and process food products for storage, distribution and consumption.

FPP.03.02: Design and apply techniques of food processing, preservation, packaging and presentation for distribution and consumption of food products.

FPP.04: Explain the scope of the food industry and the historical and current developments of food product and processing.

FPP.04.01: Examine the scope of the food industry by evaluating local and global policies, trends and customs for food production.

FPP.04.02: Evaluate the significance and implications of changes and trends in the food products and processing industry in the local and global food systems.

Aligned Washington State Academic Standards		
Science	HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.	
Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking Questions and Defining Problems Planning and Carrying Out Investigations Obtaining, Evaluating, and Communicating Information Developing and Using Models Analyzing and Interpreting Data Constructing Explanations and Designing Solutions	ETS1.A Defining and Delimiting Engineering Problems ETS1.B Developing Possible Solutions ETS1.C Optimizing the Design Solution	Cause and Effect: Mechanism and Prediction Systems and System Models Structure and Function Stability and Change

Unit 7: Food Product Development	Total Learning Hours for Unit: 25
<p>Unit Summary: This unit will include instruction related to decide, design, and develop. 7.1 Food product development moves through a series of processes to transform from an idea to a tangible food product. 7.2 Finished food products must be validated against the original concept.</p>	
<p>Performance Assessments: (Districts to complete for each unit) <i>Example assessments for this unit include:</i></p> <ul style="list-style-type: none"> Choose a new food product to develop. Apply food processes necessary to develop a tangible food product from an idea. Justify that a developed product meets consumer needs. Develop a display to highlight new food product. 	
<p>Leadership Alignment: (Districts to complete for each unit) <i>Leadership alignment must include a unit specific project/activity that aligns with the 21st Century Leadership Skills.</i> <i>Example:</i></p> <ul style="list-style-type: none"> Students think creatively, implement innovation, and communicate clearly developing and producing their new food product. 	
<p>Industry Standards and/or Competencies: Agriculture, Food, and Natural Resources (AFNR) Standards - CRP.02.01: Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community. CRP.02.02: Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community. CRP.04.01: Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings. CRP.04.02: Produce clear, reasoned and coherent written and visual communication in formal and informal settings. CRP.06.01: Synthesize information, knowledge and experience to generate original ideas and challenge assumptions in the workplace and community. CRP.06.03: Create and execute a plan of action to act upon new ideas and introduce innovations to workplace and community organizations. CRP.07.01: Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community. CRP.08.02: Investigate, prioritize and select solutions to solve problems in the workplace and community. CRP.09.02: Implement personal management skills to function effectively and efficiently in the workplace (e.g., time management, planning, prioritizing, etc.). CS.03.02: Develop and implement a plan to maintain and improve health, safety and environmental compliance and performance. CS.03.03: Apply health and safety practices to AFNR workplaces. CS.03.04: Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment. FPP.01: Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities. FPP.01.01: Analyze and manage operational and safety procedures in food products and processing facilities. FPP.01.02: Apply food safety and sanitation procedures in the handling and processing of food products to ensure food quality. FPP.02: Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products. FPP.02.01: Apply principles of nutrition and biology to develop food products that provide a safe, wholesome and nutritious food supply for local and global food systems.</p>	

FPP.02.02: Apply principles of microbiology and chemistry to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

FPP.02.03: Apply principles of human behavior to develop food products to provide a safe, wholesome and nutritious food supply for local and global food systems.

FPP.03: Select and process food products for storage, distribution and consumption.

FPP.03.01: Implement selection, evaluation and inspection techniques to ensure safe and quality food products.

FPP.03.02: Design and apply techniques of food processing, preservation, packaging and presentation for distribution and consumption of food products.

Aligned Washington State Academic Standards

Science	HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts
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Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept