Statewide Framework Document for: 010000

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.

Introduction to Agriculture, Food, and Natural Resources

Course Title: Introduction to Ag, Food, and Natural Resources		**Total Framework Hours: 180**
CIP Code: 010000	☒**Exploratory** ☐**Preparatory**	**Date Last Modified: April 25, 2016**
Career Cluster: Agriculture, Food, and Natural Resources		**Cluster Pathway: All Pathways**
Eligible for Equivalent Credit in: ☐ **Math** ☒ **Science**		**Total Number of Units: 7**

Course Overview

Summary:
A course that focuses on the general principles and practice of agricultural research and production that may prepare individuals to apply this knowledge to the solution of practical agricultural problems. Includes instruction in basic animal, plant, and soil science; animal husbandry and plant cultivation; soil conservation; and agricultural operations such as farming, ranching, and agricultural business.

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).

Unit 1: The Circles of Agricultural Education	Total Learning Hours for Unit: 10

Unit Summary:
Competencies include:
1.1 Agriculture and natural resource systems provide the three basic human needs of food, clothing, and shelter.
1.2 Organization and record keeping are important to the success of an agricultural business.
1.3 Agriculture is a broad field of study that includes agriculture systems, natural resource management, science, business, communication, and leadership.
1.4 Production of agricultural commodities occurs within specific regions of the United States.
1.5 The National FFA Organization offers members many opportunities to build necessary employment and life skills, such as leadership, personal character, and career options.
1.6 Career Development Events (CDE) expose students to numerous opportunities for academic application in agriculture.
1.7 Career opportunities exist in agriculture for all levels of education in the areas of production, processing, marketing, and regulation.
1.8 Agriculture is a broad field that encompasses many employment areas and offers a wide array of career opportunities.
1.9 Employability skills, such as work ethic, timeliness, communication, and self-direction, are essential attributes for a successful career.
2.0 Supervised Agricultural Experiences (SAE) programs provide opportunities to explore potential career choices and develop professional career goals.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:
• Determine if their basic needs are met after simulating the collection of resources during different situations.
• Develop and keep an Agriscience Notebook to record and store information.
• Interpret types of activities associated with agriculture from a case study about an agricultural entrepreneur.
• Research top commodities produced in the United States and determine costs of food to consumers.
• Explore educational and personal growth opportunities available through FFA membership.
• Compare types of dress and the role professional dress plays in success.
• Complete components of ten Career Development Events.
• Investigate the career opportunities available in agriculture.
• Classify careers according to categories in agriculture.
• Develop and maintain a career portfolio following a specific format.
• Evaluate personal characteristics, strengths, and weaknesses.
• Develop a Supervised Agricultural Experience (SAE) implementation plan.

Leadership Alignment:
- ≠ Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- ≠ The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will think creatively, manage goals and time, and be self-directed learners while planning and implementing their SAE project. Students will access and evaluate information through the use of the animal science notebook to store information accessed in this course. Students will work in groups to simulate life as a hunter-gather through the development of modern agriculture. Students will have to share their findings with the class through an informal oral presentation. Students will demonstrate self-direct learning as they independently develop an SAE project of interest and serve as managers of their own projects to produce a positive end result. Through teacher evaluation, the students will gain flexibility as they are presented with positive praise, setbacks, and criticism while completing these projects.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards
CS.01 Premier Leadership: Acquire the skills necessary to positively influence others.
CS.02. Personal Growth: Develop a skill set to enhance the positive evolution of the whole person.
CS.03. Career Success: Demonstrate those qualities, attributes and skills necessary to succeed in, or further prepare for, a chosen career while effectively contributing to society.
CS.05. Systems: Identify how key organizational structures and processes affect organizational performance and the quality of products and services.
CS.08. Technical Skills: Use tools, equipment, machinery and technology appropriate to work within areas related to AFNR.
NRS.01. Explain interrelationships between natural resources and humans necessary to conduct management activities in natural environments.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):
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

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Analyzing and Interpreting Data	ESS3.A: Natural Resources	Cause and Effect
Constructing Explanations and Designing Solutions		

Washington English Language Arts Standards (Common Core State Standards)

RST.9-10.7 – Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
WHST.9-10.10 – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
WHST.9-10.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Unit 2: Communicating Today | Total Learning Hours for Unit: 10

Unit Summary:
Competencies include:
2.1 People utilize multiple forms of verbal and nonverbal communication.
2.2 Voice, presence, and expression are used in communicating effectively.
2.3 Speeches may be informative, persuasive, or special occasion.
2.4 People utilize multiple forms of communication in their daily lives.

2.5 Parliamentary procedures are used to conduct orderly meetings.
2.6 Speaking and use of visual aids are tools used to communicate effectively.
2.7 Teamwork is essential when solving many problems and completing group tasks.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:
• Demonstrate verbal and non-verbal forms of communication in a charades-like game.
• Prepare and present a formal introduction.
• Prepare and present a formal introduction.
• Practice effective public speaking characteristics.
• Develop and present an informative speech.
• Work collaboratively to complete team building challenges.
• Use proper parliamentary procedures to voice an opinion.
• Demonstrate the proper procedures for making a main motion and an amendment.
• Develop a Prezi® presentation about agricultural careers.
• Use group norming and teamwork skills while working in a group.

Leadership Alignment:

- ≠ Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- ≠ The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students participate in public speaking and parliamentary procedure. Students will use both verbal and non-verbal forms of communication to work effectively with diverse teams. Students will be responsible to others in order to create and deliver a group presentation of an agricultural industry. Students will interact effectively with others in a group to create a mock town hall meeting to better help them utilize their knowledge of parliamentary procedure and debate.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards
CS.01. Performance Element: Premier Leadership: Acquire the skills necessary to positively influence others.
CS.02. Performance Element: Personal Growth: Develop a skill set to enhance the positive evolution of the whole person.
CS.03. Performance Element: Career Success: Demonstrate those qualities, attributes and skills necessary to succeed in, or further prepare for, a chosen career while effectively contributing to society.
CS.04. Performance Element: Systems: Examine roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.

Aligned Washington State Standards

Washington English Language Arts Standards (Common Core State Standards) -
RST.9-10.7Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.11-12.1Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
SL.9-10.4. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
SL.9-10.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
SL. 9-10.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Unit 3: The Science of Agriculture	Total Learning Hours for Unit: 30

Unit Summary:
Competencies include:
3.1 Laboratory equipment has specific uses in scientific experiments.
3.2 Understanding and following procedures and rules are essential to maintaining a safe work environment.
3.3 Emergency equipment is available and has specific uses.
3.4 Reading and understanding laboratory procedures are essential to conducting a laboratory experiment safely.
3.5 Mass, volume, temperature, and density are common laboratory measurements.
3.6 Proper and accurate measurement is important for laboratory investigation.
3.7 Scientific method is a systematic process used to solve a problem.
3.8 The level of pH is used to determine the acidity and alkalinity of a substance.
3.9 The pH scale is 0-14 where 0 is extremely acidic, 7 is neutral, and 14 is extremely basic.
3.10 The level of pH affects the health and well-being of organisms.
3.11 Mineral matter, air, water, and organic matter are found in different proportions within a soil and define soil quality.
3.12 Geographical features and environmental factors influence the formation process of soils and impact soil quality.
3.13 Soil erosion results in the loss of quality top soil and is a concern in the study of mineral soils.
3.14 Sand, silt, and clay are three sizes of mineral particles that comprise soil texture.
3.15 Soil structure and soil texture are elements that affect soil function.
3.16 The texture, structure, and color of each layer of soil within a profile are used to identify specific horizons.
3.17 Soils form in layers that have distinguishing characteristics from other layers in a soil profile.
3.18 The water cycle is an example of a naturally occurring system in which the substance can change for and location.
3.19 Land topography influences the distribution of water and pollutants.
3.20 Water pollution is caused by point and non-point sources.
3.21 The quality of water sources, such as streams and drinking water, can be determined by measuring factors such as temperature, pH, turbidity, dissolved oxygen, and total dissolved solids.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:
- ≠ Identify and describe the uses of common laboratory equipment.
- ≠ Use equipment to collect data for an experiment.
- ≠ Work with their classmates to develop a list of ten safety rules to follow.
- ≠ Locate and determine the purpose of emergency equipment items located in the classroom, laboratory, and shop facilities.

- ≠ Follow written procedures to complete a laboratory exercise.
- ≠ Measure distance, volume, mass, temperature, and density using the appropriate tools and scale.
- ≠ Use equipment to collect data for an experiment.
- ≠ Measure distance, volume, mass, temperature, and density using the appropriate tools and scale.
- ≠ Use a minimum of four science processes to design an experiment.
- ≠ Determine if a substance is an acid or a base using LabQuest® and a pH sensor.
- ≠ Test the buffering ability of water and one additional substance.
- ≠ Conduct an inquiry lab on the effect of pH on plant health.
- ≠ Write a lab report based on findings of the inquiry lab.
- ≠ Perform a skit to demonstrate the science processes used in the experiment, laboratory safety, and group communication skills.
- ≠ Conduct a sediment test to determine the particle sizes of the mineral matter and the presence of organic matter in a sample of soil.
- ≠ Investigate the effects organic matter has on soil porosity and soil air holding capacity.
- ≠ Conduct an investigation of soil deposition caused by water.
- ≠ Conduct tests to determine soil texture by feel.
- ≠ Test soil permeability to understand the relationship between soil particle size and rate of water filtration.
- ≠ Determine the texture, structure, and color of each horizon within a soil profile.
- ≠ Play a game to simulate the journey of a drop of water through the water cycle.
- ≠ Write and illustrate a story about what they learned regarding the journey a drop of water takes through the water cycle.
- ≠ Conduct an experiment that models the flow of water over a landform.
- ≠ Determine the spread of pollution from point and nonpoint sources.
- ≠ Perform tests to determine water quality using the factors of temperature, pH, turbidity, dissolved oxygen, and total dissolved solids.
- ≠ Design an experiment determining the quality of drinking water and conduct the experiment to determine its validity.
- ≠ Write a lab report regarding their experimental findings.

Leadership Alignment:

- ≠ Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students

- ≠ The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will work creatively with others to develop and deliver a presentation on the processes of science. Students will work in diverse, small groups to conduct experiments and analyze data. Students will solve problems when testing pH and correcting the level of acidity. Students will work both independently and in groups to examine the world around us. Students will work in small groups to develop a story and presentation depicting the water cycle. Through the utilization of their communication and leadership skills they will teach the class a portion of the water cycle. Students will be asked to evaluate themselves and their team mates on their abilities to work as a team towards accomplishing a task. Students will make judgments and decisions on which quality standards to test when creating and conducting an experiment on drinking water.

Industry Standards and Competencies

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

CS.03. Performance Element: Career Success: Demonstrate those qualities, attributes and skills necessary to succeed in, or further prepare for, a chosen career while effectively contributing to society.
CS.07. Performance Element: Safety, Health, and Environmental: Demonstrate appropriate health and safety procedures for AFNR occupations.
CS.08. Performance Element: Technical Skills: Use tools, equipment, machinery and technology appropriate to work within areas related to AFNR.
CS.11. Performance Element: Scientific Inquiry: Utilize scientific inquiry as an investigative method.
NRS.01. Explain interrelationships between natural resources and humans necessary to conduct management activities in natural environments.

NRS.02. Apply scientific principles to natural resource management activities.
PS.02. Prepare and implement a plant management plan that addresses the influence of environmental factors, nutrients, and soil on plant growth.

Aligned Washington State Standards

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Washington Science Standards (Next Generation Science Standards):
HS-PS1-1.Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
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-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
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 trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Planning and Carrying Out Investigations	ESS3.A: Natural Resources	Cause and Effect
Analyzing and Interpreting Data	PS1. B Chemical Reactions	Mechanism and Prediction
Obtaining, Evaluating, and Communicating Information	ESS2.A Earth Materials and Systems	Structure and Function
Asking Questions and Defining Problems	ESS2.C The Roles of Water in Earth's Surface Processes	Patterns
Developing and Using Models		

Washington English Language Arts Standards (Common Core State Standards)
RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
WHST.9-10.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

SL.9-10.2 Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

Unit 4: Biology in Agriculture	Total Learning Hours for Unit: 40

Unit Summary:
Competencies include:
4.1 Animal and plant cells have many similarities, especially in regards to cell function; however, there are important structural differences between the two cell types.
4.2 The nucleus of an animal and a plant cell is important for several life sustaining processes, such as cell division and protein synthesis.
4.3 DNA is genetic material that combined with protein comprises the chromosomes found inside animal and plant cell nuclei.
4.4 Genes are a combination of DNA segments that define animal and plant physical appearance.
4.5 Offspring of animals and plants derive their genetic traits from both parents.
4.6 Classification of people, places, and things is a basic skill used in daily life, scientific research, and the agricultural industry.
4.7 Objects can be classified based on their purpose, form, usefulness, and visual characteristics of anatomical or physiological similarities.
4.8 Dichotomous keys are a classification tool used to identify objects based on their physical features.
4.9 Ecosystems are an interaction between organisms and the environment in which the organisms live.
4.10 Energy flows from producers (plants) to consumers (animals).
4.11 Plants and animals depend on each other for survival.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- ≠ Identify and label the parts of a cell including each cell organelle function.
- ≠ Determine the differences in structural parts between an animal and plant cell.
- ≠ Demonstrate the correct use of a microscope in order to prepare a microscope slide and identify the nucleus of an onion cell.
- ≠ Extract the DNA bundles from strawberry tissue for observation.
- ≠ Construct a DNA model and demonstrate how DNA replication happens in a cell.
- ≠ Identify differences in physical features of people and trace their family traits.
- ≠ Identify similarities in characteristics to trace family traits.
- ≠ Use concept mapping software to organize thoughts.
- ≠ Classify objects based on their physical characteristics.
- ≠ Categorize animals by gender and species.
- ≠ Develop a flowchart to classify 20 different tools.
- ≠ Use a dichotomous key to identify specimen based on physical features.
- ≠ Simulate the flow of energy in an ecosystem.
- ≠ Conduct an experiment to determine the interdependence of plants and animals.
- ≠ Complete a WebQuest researching an ecosystem.
- ≠ Develop a model and poster depicting the ecosystem they studied.
- ≠ Record key points of ecosystems presented by classmates.

Leadership Alignment:

- ≠ Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- ≠ The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will work in diverse, small groups to conduct experiments and analyze data. Students will utilize and manage information related tools and specimens to apply technology effectively in order to create concept maps and flowcharts. Students will work in diverse groups to develop a model and poster on an ecosystem in order to guide and lead others in a presentation which peers must record key elements of the ecosystem.

Industry Standards and Competencies

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

CS.04. Systems: Examine roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment.
CS.07. Performance Element: Safety, Health, and Environmental: Demonstrate appropriate health and safety procedures for AFNR occupations.
CS.08. Performance Element: Technical Skills: Use tools, equipment, machinery and technology appropriate to work within areas related to AFNR.
CS.11. Performance Element: Scientific Inquiry: Utilize scientific inquiry as an investigative method.
AS.02. Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.
NRS.01. Performance Element: Explain interrelationships between natural resources and humans necessary to conduct management activities in natural environments.
PS.01. Apply knowledge of plant classification, plant anatomy and plant physiology to the production and management of plants.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

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.
HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
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.
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.
HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL		
Science and Engineering Practice	**Disciplinary Core Idea**	**Crosscutting Concept**
Asking Questions and Defining Problems	LS1.A Structure and Function	Systems and System Models
Analyzing and Interpreting Data	LS3.A Inheritance of Traits	Structure and Function
Obtaining, Evaluating, and Communicating Information	LS3.B Variation of Traits	Patterns
	LS1.C Organization for Matter and Energy Flow in Organisms	Cause and Effect
	LS2A: Interdependent Relationship	Stability and Change
	LS2B: Cycles of Matter and Energy Transfer in Ecosystems	
	LS2.C Ecosystems Dynamics, Functions, and Resilience	

Washington English Language Arts Standards (Common Core State Standards)

RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

RST .11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

WHST .9-12.1 Write arguments focused on discipline-specific content.

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

SL.9-10.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Unit 5: Plants and Animals	Total Learning Hours for Unit: 40

Unit Summary:
Competencies include:
5.1 Food is derived from animal and plant products.
5.2 Consumption trends of food have changed over time based on an increase of information about health issues and technological advances.
5.3 Food must be produced, transported, processed, and stored in a safe way.
5.4 There are many points where food can be contaminated while in route to the consumer.
5.5 Plants have roots, stems, leaves, and flowers, which are all vital to survival.
5.6 Flowers, consisting of four main parts, produce seeds for reproduction.
5.7 Seeds require moisture and warmth for germination.
5.8 Plants convert raw materials using the energy of the sun into sugar and oxygen.
5.9 Plant cells use water, oxygen, and glucose to produce energy and metabolic by-products of carbon dioxide and water.
5.10 Production and management of plants are based upon environmental conditions, such as temperature.
5.11 Plants require adequate amounts of water for survival, growth, and development.
5.12 The three primary nutrients, nitrogen, phosphorus, and potassium, are necessary for the healthy growth of plants.
5.13 Body parts of animals vary among different species.
5.14 Production and management of animals are based on anatomical and physiological characteristics.
5.15 Animals are selected based upon the quality and correctness of anatomical structure and productive potential.
5.16 Animals have a complex set of systems that must work together.
5.17 Animals require food, shelter, and water for survival.
5.18 The nutrients needed by animals include protein, carbohydrates, fats, vitamins, minerals, and water and are found in many feed sources.
5.19 Shelter helps animals control body temperature.
5.20 Animals perceive potential dangers differently than humans.
5.21 The production of food, fiber, and fuel sometimes creates ethical dilemmas for producers and consumers.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- ≠ Document the plant and animal food products consumed in a twenty-four hour period.
- ≠ Determine the percentage of plant and animal food products they consume.
- ≠ Conduct an experiment to determine bacterial levels of meat samples when refrigerated, stored at room temperature, and cooked.
- ≠ Observe and record growth of bacterial cultures.
- ≠ Research the path a prepared food item takes from production to processing and present their findings to the class.
- ≠ Solve a problem related to foodborne illness outbreak.
- ≠ Identify and sketch the four basic plant parts.
- ≠ Describe the functions of plant parts.
- ≠ Construct a model depicting the parts of a complete flower.
- ≠ Conduct a germination trial to determine the germination rate of bean seeds.
- ≠ Determine the presence of starch in plants that have received different light treatments.
- ≠ Collect data on the rate of respiration and photosynthesis of plant leaves.
- ≠ Determine the relationship between water availability and turgor pressure.
- ≠ Calculate growing degree days for two locations to determine crop maturity.
- ≠ Research plant macronutrients and record the functions in plants, deficiency symptoms, and sources for each.
- ≠ Design and conduct an inquiry experiment on one environmental factor to investigate the optimal growth range for a plant.

- ≠ Write a lab report and develop a presentation to report their findings from an inquiry experiment.
- ≠ Study and learn the basic anatomical parts of an animal.
- ≠ Develop a poster of the external anatomy of an animal that will be used to teach others.
- ≠ Make decisions based on given priorities and criteria, and analyze objects as they compare ideal criteria.
- ≠ Evaluate a class of market hogs based on specific priorities.
- ≠ Develop a concept map of the internal body systems and their relationships.
- ≠ Research and identify the six essential nutrients and the functions of each.
- ≠ Classify feedstuffs according to their nutrient value.
- ≠ Conduct an experiment to demonstrate the effect of insulation on maintaining body heat.
- ≠ Draw conclusions on the perceptions of stimuli based on observations of optical illusions.
- ≠ Determine ethical options to form an opinion on the use of meat for human consumption and related environmental impact issues.

Leadership Alignment:

- ≠ Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- ≠ The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will work creatively with others in pairs to examine the steps it takes for commodities to get from the farm to their fork. Students will work with partners to conduct a laboratory experiment on food safety. Students will be responsible to other when they present their findings to the class.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards

CS.05. Systems: Identify how key organizational structures and processes affect organizational performance and the quality of products and services.
CS.06. Performance Element: Examine the importance of health, safety, and environmental management systems in organizations and their importance to performance and regulatory compliance.
CS.07. Performance Element: Safety, Health, and Environmental: Demonstrate appropriate health and safety procedures for AFNR occupations.
CS.08. Performance Element: Technical Skills: Use tools, equipment, machinery and technology appropriate to work within areas related to AFNR.
CS.09. Technical Skills: Compare and contrast issues affecting the AFNR industry.
CS.11. Scientific Inquiry: Utilize scientific inquiry as an investigative method.
AS.01. Examine the components, historical development, global implications, and future trends of the animal systems industry.
AS.02. Classify, evaluate, select, and manage animals based on anatomical and physiological characteristics.
AS.03. Provide for the proper health care of animals.
AS.05. Evaluate and select animals based on scientific principles of animal production.
AS.08. Analyze environmental factors associated with animal production.
BS.02. Demonstrate laboratory skills as applied to biotechnology.
FPP.01. Examine components of the food industry and historical development of food products and processing..
PS.01. Apply knowledge of plant classification, plant anatomy and plant physiology to the production and management of plants.
PS.02. Prepare and implement a plant management plan that addresses the influence of environmental factors, nutrients, and soil on plant growth.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

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

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
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.
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.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking Questions and Defining Problems	LS1.C Organization for Matter and Energy Flow in Organisms	Structure and Function
Planning and Carrying Out Investigations		Cause and Effect
Analyzing and Interpreting Data		
Constructing Explanations and Designing Solutions		
Engaging in Argument from Evidence		
Obtaining, Evaluating, and Communicating Information		
Developing and Using Models		

Washington English Language Arts Standards (Common Core State Standards)
RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Unit 6: Mechanics of Agriculture | Total Learning Hours for Unit: 20

Unit Summary:
Competencies include:
6.1 People depend on consumable forms of energy, such as fuel and electricity, which are used in everyday life.
6.2 Agricultural commodities can be converted to alternative energy sources.

6.3 Many renewable energy sources, such as wind, solar, and biofuels, are currently being used in the United States.
6.4 The efficiency of energy and the amount of energy produced varies among sources.
6.5 The sustainable use of fossil fuels and renewable energy sources are the basis of many issues and concerns among consumer groups.
6.6 All property is legally defined and recorded based on a standardized regulatory system.
6.7 There are federal, state, county, and local laws that govern how land can be used.
6.8 Global Positioning System (GPS) is a method used to determine an exact location of a point on the earth using a coordinate system based on longitude and latitude readings.
6.9 Applications of Global Positioning Systems and Geographic Information Systems are used in all disciplines of agriculture and natural resource systems to improve agricultural production efficiencies and environmental quality.
6.10 English and metric linear measurement systems are two useful forms of measurement used every day.
6.11 Measurement accuracy is critical for project success.
6.12 The proper use of scale is important when drafting and designing project plans.
6.13 Agricultural projects involve planning, design, construction, implementation, and evaluation.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- ≠ Compare the combustion of two common fuels used for energy production.
- ≠ Construct a solar energy system and compare the production of electricity under different light conditions.
- ≠ Develop an educational display that will describe an alternative energy source and the impact agriculture has on that source.
- ≠ Draw a map and write directions from the school to their home.
- ≠ Write directions based on the map of another student.
- ≠ Describe parcels of land using the rectangular survey system and the metes and bounds system.
- ≠ Use three points to triangulate a location.
- ≠ Determine latitude, longitude, and altitude using a GPS unit.
- ≠ Collect soil data and record the GPS coordinates of each soil location.
- ≠ Use the Soil Web Survey to research information on each soil location.
- ≠ Discuss issues pertaining to zoning and land use and present a persuasive debate at a mock town hall meeting.
- ≠ Use English and metric measurement systems to determine the length of objects.
- ≠ Convert fractions and decimals.
- ≠ Use proportions to solve problems and determine dimensions of objects drawn to scale.
- ≠ Draw three-view plans of three-dimensional objects.
- ≠ Write step-by-step directions for a coast-to-coast trip and calculate mileage and fuel cost.
- ≠ Develop complete project plans for a birdhouse including researching the needs of the bird, designing, sketching, drawing, writing directions, and estimating a bill of materials.

Leadership Alignment:

- ≠ Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- ≠ The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will be working in diverse, small groups to express the importance of safety in the Agriculture classroom. Students will communicate effectively to share their opinion in a town hall meeting and make judgments and decisions on the land zoning issue.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards

CS.01. Premier Leadership: Acquire the skills necessary to positively influence others.
CS.03. Career Success: Demonstrate those qualities, attributes and skills necessary to succeed in, or further prepare for, a chosen career while effectively contributing to society.
CS.05. Performance Element: Systems: Identify how key organizational structures and processes affect organizational performance and the quality of products and services
CS.06. Performance Element: Examine the importance of health, safety, and environmental management systems in organizations and their importance to performance and regulatory compliance.
CS.07. Performance Element: Safety, Health, and Environmental: Demonstrate appropriate health and safety procedures for AFNR occupations.
CS.08. Performance Element: Technical Skills: Use tools, equipment, machinery and technology appropriate to work within areas related to AFNR.
CS.09. Performance Element: Technical Skills: Compare and contrast issues affecting the AFNR industry.
CS.10. Performance Element: Technical Skills: Envision emerging technology and globalization to project its influence on widespread markets.
CS.11. Performance Element: Scientific Inquiry: Utilize scientific inquiry as an investigative method.
ESS.06. Performance Element: Use tools, equipment, machinery and technology to accomplish tasks in environmental service systems.
NRS.01. Performance Element: Explain interrelationships between natural resources and humans necessary to conduct management activities in natural environments
NRS.02. Performance Element: Apply scientific principles to natural resource management activities.
NRS.05. Performance Element: Use effective methods and venues to communicate natural resource processes to the public.
PST.01. Performance Element: Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.
PST.02. Performance Element: Design, operate and maintain mechanical equipment, structures, biological systems, land treatment, power and technology.
PST.04. Performance Element: Plan, build and maintain agricultural structures.
PST.05. Performance Element: Apply technology principles in the use of agricultural technical systems.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

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

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking Questions and Defining Problems	ESS3.A: Natural Resources	Cause and Effect
Developing and Using Models	ESS3.C Human Impacts on Earth Systems	Mechanism and Prediction
Planning and Carrying Out Investigations		
Analyzing and Interpreting Data		
Using Mathematics and Computational Thinking		
Engaging in Argument from Evidence		

Washington English Language Arts Standards (Common Core State Standards)

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
SL.9-10.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively

SL.9-10.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

Educational Technology:

2. Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.
2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.
2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.
2.2.1 Develop skills to use technology effectively.
2.2.2 Use a variety of hardware to support learning.
2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.
2.3.1 Select and use common applications.
2.3.2 Select and use online applications.
2.4 Adapt to Change (Technology Fluency): Transfer current knowledge to new and emerging technologies.

Unit 7: Agriscience	Total Learning Hours for Unit: 30

Unit Summary:

Competencies include:
7.1 Agriculture plays an essential role in society and feeding the world.
7.2 People develop goals in order to achieve their dreams.
7.3 Accurate record keeping is important to the success of an agricultural enterprise.

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- ≠ Write a brief proposing a plan to be used at a presentation on solving world hunger.
- ≠ Write a vision statement and develop personal goals.
- ≠ Review their work from the year and complete their Career Portfolio.

Leadership Alignment:

- ≠ Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- ≠ The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will be working on an analysis problem on Solving World Hunger. They will analyze media and prepare their own media product to present their solution to hunger. It is an accumulation of all of the knowledge they have gained in the course. They should consider what they have learned about animal populations, reproduction, food products, agricultural careers and even agricultural mechanics to come up with a brief. Students will finalize their Agriscience Portfolio for the year as evidence of managing goals and timelines. They will act as self-direct learners when recording their SAE progress and preparing to give an end of the year report.

Industry Standards and Competencies

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

CS.01. Performance Element: Premier Leadership: Acquire the skills necessary to positively influence others.
CS.02. Performance Element: Personal Growth: Develop a skill set to enhance the positive evolution of the whole person.

CS.03. Performance Element: Career Success: Demonstrate those qualities, attributes and skills necessary to succeed in, or further prepare for, a chosen career while effectively contributing to society. CS.09. Technical Skills: Compare and contrast issues affecting the AFNR industry.
Aligned Washington State Standards
Washington Science Standards (Next Generation Science Standards): 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-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
Washington English Language Arts Standards (Common Core State Standards) RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. SL.9-10.4. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. SL.9-10.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. SL. 9-10.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

21st Century Skills
Students will demonstrate in this course:

LEARNING & INNOVATION	INFORMATION, MEDIA & TECHNOLOGY SKILLS	LIFE & CAREER SKILLS
Creativity and Innovation ☒Think Creatively ☒Work Creatively with Others ☐Implement Innovations **Critical Thinking and Problem Solving** ☐Reason Effectively ☐Use Systems Thinking ☒Make Judgments and Decisions ☒Solve Problems **Communication and Collaboration** ☒Communicate Clearly ☒Collaborate with Others	**Information Literacy** ☒Access and Evaluate Information ☐Use and Manage Information **Media Literacy** ☒Analyze Media ☒Create Media Products **Information, Communications and Technology (ICT Literacy)** ☒Apply Technology Effectively	**Flexibility and Adaptability** ☐Adapt to Change ☒Be Flexible **Initiative and Self-Direction** ☒Manage Goals and Time ☒Work Independently ☒Be Self-Directed Learners **Social and Cross-Cultural** ☒Interact Effectively with Others ☒Work Effectively in Diverse Teams **Productivity and Accountability** ☐Manage Projects ☒Produce Results **Leadership and Responsibility** ☒Guide and Lead Others ☒Be Responsible to Others

Statewide Framework Document for: 010308

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 life science or 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.

Agroecology and Sustainability

Course Title: Agroecology and Sustainability		**Total Framework Hours: 180**
CIP Code: 010308	☒ **Exploratory** ☐ **Preparatory**	**Date Last Modified: April 25, 2016**
Career Cluster: Agriculture, Food, and Natural Resources		**Cluster Pathway: Natural Resources Systems**
Eligible for Equivalent Credit in: ☐ **Math** ☒ **Science**		**Total Number of Units: 9**

Course Overview

Summary:
Agroecology and Sustainability focuses on agricultural principles and practices that, over the long term, enhance environmental quality, make efficient use of nonrenewable resources, integrate natural biological cycles and controls, and are economically viable and socially responsible; and that may prepare individuals to apply this knowledge to the solution of agricultural and environmental problems. Includes instruction in principles of agroecology, crop and soil sciences, entomology, horticulture, animal science, weed science and management, soil fertility and nutrient cycling, applied ecology, agricultural economics, and rangeland ecology and watershed management

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).

Unit 1: Career Exploration, Opportunities, and Readiness	Total Learning Hours for Unit: 10

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Interview a community member working in local agriculture and/or the broader food system and report findings with a presentation.
- Participate in a food system simulation exercise --"Community Build" -- to explore roles and influencing factors in the food system.
- Record notes and reflections from a panel discussion of area employers.
- Participate in a mock job interview.
- Produce a well-written cover letter, job application, and follow-up letter.
- Research potential career pathways, identifying requirements, pay scale, and job sustainability.
- Record notes and reflections related to information presented in class regarding the importance of plants.
- Develop a Supervised Agricultural Experience (SAE) implementation plan.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will access information and make decisions about their futures as they consider potential career choices through research and career panels.
Through participation in the food system simulation exercise and food system worker interviews, students will engage analytical and systems thinking and demonstrate their understanding of complex interrelated systems with presentations to their peers.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards -
CRP.10. Plan education and career path aligned to personal goals.
CS.05. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.
CS.05.01.03.a. Research and summarize specific tools (e.g., resumes, portfolios, cover letters, etc.) and processes (e.g., interviews, applications, etc.) needed to pursue a career in an AFNR pathway.
CS.03.01. Performance Indicator: Communication: Demonstrate oral, written and verbal skills.
CS.03.01.01.b. Select the appropriate form of technical and business writing or communication for a specific situation.
CS.03.01.02.b. Prepare a resume.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):
HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

Unit 2: Ecological Relationships, Management, Conservation and Health	Total Learning Hours for Unit: 20

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Define agroecology
- Discuss agroecosystems and compare production, productivity, resilience, stability, reliance on human input, and sustainability, comparing natural ecosystems, and sustainable and conventional agroecosystems.
- Determine locally available and renewable resources, alpha diversity,
- Evaluate systems for productivity, stability, sustainability and equitability
- Investigate management options of pests, diseases, and weeds
- Discuss the integration of livestock into a system
- Determine ways to conserve soil, water, energy, genetic resources, and capital through on-farm choices.
- Determine farming practices that will reduce or eliminate environmental pollution with nitrates, toxic gases, or other materials generated by burning or overloading agroecosystems with nutrients
- Review and determine ways to minimize or eliminate materials that have potential to harm the environment or the health of farmers, farm workers, and consumers.
- Assess and value the overall health of an agroecosystem including human health, cultural health, environmental health, and animal and plant health

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will access and evaluate information and use and manage information, reason effectively, and make judgements and decisions while evaluating ecological relationships and systems, and determining best management practices.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards -
CRP.10. Plan education and career path aligned to personal goals.
CS.05. Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food & Natural Resources career pathways.
CS.05.01.03.a. Research and summarize specific tools (e.g., resumes, portfolios, cover letters, etc.) and processes (e.g., interviews, applications, etc.) needed to pursue a career in an AFNR pathway.
CS.03.01. Performance Indicator: Communication: Demonstrate oral, written and verbal skills.
Level II: CS.03.01.01.b. Select the appropriate form of technical and business writing or communication for a specific situation.
Level II: CS.03.01.02.b. Prepare a resume.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):
HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

Unit 3: The Living Soil	Total Learning Hours for Unit: 25

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- ≠ Conduct tests to determine soil texture using sense of touch, ribbon tests, and soil jars.
- ≠ Examine a soil sample to determine what kinds of microorganisms are present.
- ≠ Test soil permeability through "Soil Races" activity to understand the relationship between soil particle size and rate of water filtration. Students will write sample lab report to record results and draw conclusions (assessed through lab report rubric and conclusion rubric)
- ≠ Conduct an experiment providing evidence for the role of organic matter related to water holding capacity of the soil through "Soil Races" activity.
- ≠ Identify components commonly used in potting media through mixing own potting soil for plant production.
- ≠ Learn and demonstrate ability to make simple compost piles and know benefits of composting for the soil.
- ≠ Conduct a soil test to analyze nutrients, including Cation Exchange Capacity (CEC), pH, and organic matter content.
- ≠ Participate in general formative assessments and summative assessments (quizzes/tests) utilized to assess student knowledge
- ≠ Students will expand understanding of nutrient cycling and composting through a plant growth comparison experiment utilizing various soil structures, compost mediums, soil, and locally available bio solids
- ≠ Students will compare the roles of biotic and abiotic soil components and how they interact to create structure, tilth, and hold/release nutrients

Leadership Alignment:

- ≠ Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- ≠ The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will evaluate information based on soil test data.
Students will solve problems, and produce results by using learned information to construct an effective compost system.
Students will work creatively with others, collaborate with others, and interact effectively with others to conduct soil tests.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards - Plant Science Pathway:
PS.01.02. Prepare and manage growing media for use in plant systems.
PS.01.02.01.a. Identify the major components of growing media and describe how growing media support plant growth.
PS.01.02.01.b. Describe the physical and chemical characteristics of growing media and explain the influence they have on plant growth.
PS.01.02.02.a. Identify the categories of soil water.
PS.01.02.02.b. Discuss how soil drainage and water holding capacity can be improved.
PS.01.03. Develop and implement a fertilization plan for specific plants or crops.
PS.01.03.01.a. Identify the essential nutrients for plant growth and development and their major functions (e.g., nitrogen, phosphorous, potassium, etc.)
PS.01.03.02.a. Discuss the influence of pH and cation exchange capacity on the availability of nutrients.
PS.01.03.03.a. Collect soil and plant tissue samples using generally accepted procedures and explain how incorrect sample collection will affect the results of a laboratory analysis.
PS.01.03.05.a. Research and summarize production methods focused on soil management (e.g., crop rotation, companion planting, cover crops, etc.).
PS.03.02. Develop and implement a plant management plan for crop production.

PS.03.02.02.a. Explain the reasons for preparing growing media before planting.
PS.03.02.02.b. Prepare soil for planting with the addition of amendments.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):
HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
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-ETS1-1. 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 trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 9-10):
RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

Unit 4: Anatomy and Physiology	Total Learning Hours for Unit: 25

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- ≠ Identify the four major parts of plant structure, describe the function of the major plant parts, examine a root structure and sketch representations of the structural form for a root through drawing and written summaries.
- ≠ Identify differences between monocotyledon and dicotyledon features through art-based assignments.
- ≠ Identify the structures of seeds and plant embryos.
- ≠ Identify the characteristics of simple and compound leaves through drawing and field identification
- ≠ Explain the process plants use to produce and store food, explain why leaves are important to plants, identify the parts of a flower and explain the function for each part through lab and student drawing assignments
- ≠ Construct a model representing the parts/functions of a flower.
- ≠ Demonstrate overall understanding of anatomy/physiology through teaching elementary aged students about plant science.
- ≠ Students will utilize the growth comparison lab to compare the root structures, leaf, flower, and fruit growth of plants in soils medium

Leadership Alignment:

- ≠ Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.

≠ The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will use systems thinking and analyze how parts of a whole interact with each other through constructing a model of a plant and describing its functions.
Students will communicate clearly and collaborate with others as they teach fellow students about plants' processes of food production.
Students will make decisions when identifying plants by effectively analyzing plant characteristics.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards

PS.01.02. Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.
PS.01.02.02.a. Identify the components, the types and the functions of plant roots.
PS.01.02.02.c. Relate the active and passive transport of minerals into and through the root system to plant nutrition.
PS.01.02.03.a. Identify the components and the functions of plant stems.
PS.01.02.04.a. Discuss leaf morphology and the functions of leaves.
PS.01.02.04.b. Explain how leaves capture light energy and allow for the exchange of gases.
PS.01.02.04.c. Explain the relationships between leaf structure and functions and plant management practices.
PS.01.02.05.a. Identify the components of a flower, the functions of a flower and the functions of flower components.
PS.01.02.05.b. Identify the different types of flowers and flower forms.
PS.01.02.05.c. Apply the knowledge of flower structures to plant breeding, production and use.
PS.01.03. Apply knowledge of plant physiology and energy conversion to plant systems.
PS.01.03.01.a. Explain the basic process of photosynthesis and its importance to life on Earth.
PS.01.03.01.b. Explain requirements necessary for photosynthesis to occur and identify the products and byproducts of photosynthesis.
PS.01.03.02.a. Explain cellular respiration and its importance to plant life.
PS.01.03.02.b. Explain factors that affect cellular respiration and identify the products and byproducts of cellular respiration.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
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.
HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
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.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 9-10):

RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

Unit 5: Plant Production	Total Learning Hours for Unit: 25

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- ≠ Dissect a complete flower and identify the individual parts.
- ≠ Conduct a lab related to issues involving seed dispersal including relationship between plants and animals in this process
- ≠ Identify the different stages of mitosis in plant root cells.
- ≠ Participate in presentations, seminars, and written summaries to understand genetic inheritance in order to learn about the role genetics plays in plant production.
- ≠ Learn and then teach basic plant sexual reproduction including flower anatomy, role of pollinators, and seed dispersal. Demonstrate how to perform common asexual propagation methods, such as grafting, budding, layering, division, and cuttings properly through interactive workshop,
- ≠ Compare and contrast different asexual propagation methods.
- ≠ Decide the most appropriate method of asexual reproduction for different types of plant material.
- ≠ Define, compare and contrast various seed types including hybrid, GMO, heirloom, F1, organic, and conventional.
- ≠ Explore current bee crisis through movie and discussion.
- ≠ Discuss the use of integrated pest management and beneficial insects as management tools

Leadership Alignment:

- ≠ Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- ≠ The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will evaluate information critically and competently as they compare and contrast various reproduction strategies of plants.
Students will interact effectively with others in seminars, and will manage goals and time while discussing genetic inheritance and GMOs.
Students will reason effectively and use and manage information to conduct seed dispersal lab.
Students will understand global issues relating to the bee crisis.
Through making judgments and decisions students will identify the most appropriate method of asexual reproduction for different types of plant material.
Students will communicate clearly and collaborate with others as they teach elementary aged students about basic plant sexual reproduction and flower anatomy.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards
PS.01.02. Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.
PS.01.02.01.b. Compare and contrast mitosis and meiosis.
PS.01.02.05.a. Identify the components of a flower, the functions of a flower and the functions of flower components.
PS.01.02.05.c. Apply the knowledge of flower structures to plant breeding, production and use.
PS.01.02.06.a. Explain the functions and components of seeds and fruit.
PS.01.02.06.b. Identify the major types of fruit.
PS.01.02.06.c. Apply the knowledge of seed and fruit structures to plant culture and use.
PS.03.01. Demonstrate plant propagation techniques.
PS.03.01.01.a. Explain pollination, cross-pollination and self-pollination of flowering plants.

PS.03.01.01.b. Diagram the process of plant fertilization.
PS.03.01.02.a. Demonstrate sowing techniques and provide favorable conditions for seed germination.
PS.03.01.02.b. Handle seed to overcome seed dormancy mechanisms and to maintain seed viability and vigor.
PS.03.02. Develop and implement a plant management plan for crop production.
PS.03.02.04.a. Observe and record environmental conditions during the germination, growth and development of a crop.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 9-10):

RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

Unit 6: Food Webs and Energy Cycles	Total Learning Hours for Unit: 25

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- ≠ Learn about the food web by participating in a workshop about composting where they are introduced to concepts of bio-herd, decomposition, and nutrient cycling.
- ≠ Explore the importance of Nitrogen (N), Phosphorous (P), and Potassium K for soil health, causes of nutrient deficiencies, and effect of deficiencies on plant health through potting soil workshop.
- ≠ Watch videos and engage with an interactive presentation to explore carbon & nitrogen cycles.
- ≠ Demonstrate their understanding of the carbon cycle by creating a diagram using materials from the farm.
- ≠ Students demonstrate their understanding of the nitrogen cycle by identifying places on the farm (through a scavenger hunt activity) where nitrogen cycles through; where nitrogen might leach from the soil, or enter the environment, and by explaining what environmental impacts effect the level of nitrogen in the soil.
- ≠ Students demonstrate their learning of both cycles by teaching the content to younger children during field trips.

Leadership Alignment:

- ≠ Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- ≠ The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will manage projects and be responsible to others and communicate clearly while leading groups of elementary children through workshops on composting.
Students will communicate clearly, and collaborate with others as they teach younger students about the carbon and nitrogen cycles and food webs.
Students will access and evaluate information by participating in class activities such as watching videos and interactive presentations.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards
PS.02.03. Performance Indicator: Apply knowledge of plant physiology and energy conversion to plant systems.
PS.01.01. Performance Indicator: Determine the influence of environmental factors on plant growth.
PS.01.03. Performance Indicator: Develop and implement a fertilization plan for specific plants or crops.
PS.01.03.01.a. Identify the essential nutrients for plant growth and development and their major functions (e.g., nitrogen, phosphorous, potassium, etc.).
PS.01.03.01.b. Analyze the effects of nutrient deficiencies and symptoms and recognize environmental causes of nutrient deficiencies.
PS.01.03.06.a. Summarize the impact of environmental factors on nutrient availability (e.g., moisture, temperature, pH, etc.).
PS.01.03.06.b. Assess and describe the impact environmental factors have on a crop.
CS.06. Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.
CS.06.01.01.a. Research and explain the foundational cycles in AFNR (e.g., water cycle, nutrient cycle, carbon cycle, etc.)
CS.06.01.01.c. Teach others about the impact of foundational cycles within AFNR systems.
ESS.04. Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).

ESS.04.02.03.a. Research and summarize the benefits and processes of composting.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

Washington English Language Arts Standards (Common Core State Standards)

RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

Unit 7: Working with Nature | Total Learning Hours for Unit: 20

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- ≠ Conduct lab related to common plant diseases and summarize the similarities and the differences among disease-causing agents.
- ≠ Monitor specific crops to develop an understanding of plant disease, its causes, and means of prevention and control.
- ≠ Conduct an experiment to determine the effects of greenhouse coverings on temperature.
- ≠ Research irrigation methods and compare each method to understand function and purpose.
- ≠ Use multi-media resources including “Lexicon of Food” to study major sustainable agriculture topics including seeds, CSA, local vs. organic, monoculture vs. polyculture, and permaculture.
- ≠ Review content through Jeopardy-style game reviewing major organic methods of disease and pest control (proper spacing, crop rotation, row cover, healthy soil, beneficial insects)
- ≠ Research sustainable pest prevention and control methods and debate pros and cons.
- ≠ Students will understand various composting systems including vermiculture, black soldier flies, 3 bin systems, and mychrorizal inoculation
- ≠ Students will articulate the human impacts with nutrient cycling and closed system farming
- ≠ Students will explain the effects of crop rotations, cover crops, and animal grazing and manure cycling on nutrient cycling, nutrient management, and pest and disease control.

Leadership Alignment:

- ≠ Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- ≠ The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Through group discussions and debates, students will think creatively and communicate clearly to understand the meanings and values that others discuss and to participate effectively.
Students will reason effectively to develop an understanding of plant diseases, process information, and conduct experiments
Students will make judgments and decisions as they effectively analyze and evaluate evidence, arguments, claims and beliefs in preparing to debate various pest control methods.
Students will solve problems by identifying and asking significant questions that clarify various points of view and lead to better solutions.
Through conducting labs students will analyze and evaluate results, and reflect critically on outcomes and data collected.
Through research assignments, students will access and evaluate information accurately, and critically to form opinions about sustainable pest prevention and control methods.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards
PS.03.02. Performance Indicator: Develop and implement a plant management plan for crop production.
PS.03.02.01.a. Explain the importance of starting with pest- and disease-free propagation material.
PS.03.03. Performance Indicator: Develop and implement a plan for integrated pest management.
PS.03.03.01.a. Identify types of plant pests and disorders.
PS.03.03.01.b. Identify major local weeds, insect pests and infectious and noninfectious plant diseases.
PS.03.03.02.a. Describe damage caused by plant pests and diseases.
PS.03.03.03.a. Describe pest control strategies associated with integrated pest management.
PS.03.03.03.b. Describe types of pesticide controls and formulations.
PS.03.03.04.a. Explain risks and benefits associated with the materials and methods used in plant pest management.
PS.03.03.04.c. Evaluate environmental and consumer concerns regarding pest management strategies.
PS.03.04. Apply principles and practices of sustainable agriculture to plant production.
PS.03.04.01.a. Compare and contrast the alignment of different production systems (conventional and organic) with USDA sustainable practices criteria.
PS.03.04.02.a. Summarize national/international and local/regional food production systems.
PS.03.04.03.a. Identify and summarize impacts of environmental conditions on plants.
PS.03.04.02.b. Compare and contrast the impact on greenhouse gas, carbon footprint of the national/international production system with local/regional production system markets.
PS.03.01.05.b. Give examples of the risks and advantages associated with genetically modified plants.

Agriculture, Food, and Natural Resources Cluster Skill Content Standards
CS.04. Demonstrate stewardship of natural resources in AFNR activities.
CS.04.01. Identify and implement practices to steward natural resources in different AFNR systems.
CS.04.01.02.a. Read and interpret the definition of sustainability and summarize how it relates to AFNR activities.
CS.04.01.02.b. Analyze and assess sustainability practices that can be applied in AFNR systems (e.g., energy efficiency, recycle/reuse/repurpose, green resources, etc.).
CS.04.01.01.c. Devise strategies for stewarding natural resources at home and within community.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources.
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 trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Literacy Standards (Grades 9-10):

RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Unit 8: Growing Experiment	Total Learning Hours for Unit: 20

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- ≠ Apply their learning to a farm or garden and grow food for the community (food bank, cafeteria, social service agency).
- ≠ Successfully meet production goals.
- ≠ Solicit feedback from consumers (cafeteria staff, students, CSA members) on quality and presentation of produce.
- ≠ Investigate environmental influences on crop production through “farm walks” and observation journals.
- ≠ Identify how pests affect crop quality, types of pests responsible for crop predation, and specific symptoms through ‘farm walks’.
- ≠ Examine how the rate of water loss is altered by environmental conditions.
- ≠ Investigate the interactions between animals and plants to understand the role of photosynthesis in biological systems.
- ≠ Collect evidence of the dependence of photosynthesis with light.
- ≠ Examine the relationship between the rate of photosynthesis and light spectrum quality.
- ≠ Conduct an investigation determining the effects of light intensity on plant growth.
- ≠ Calculate a growing schedule for a crop started on the same date, but have three different maturity target dates.
- ≠ Design and conduct an experiment to show evidence of the effects for different variations of treatments required for seed germination.
- ≠ Review key concepts through Jeopardy-style games where teams answer questions through various methods.
- ≠ Students will compare the effects of plant spacing, interplanting, nutrient uptake, and human management on yield per foot.
- ≠ Students will learn about GAP certification and food safety and marketing.
- ≠ Students will set up a market booth at a local farmers market, community event, or the school for a day.

Leadership Alignment:

- ≠ Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- ≠ The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will listen effectively to decipher meaning, including knowledge, values, attitudes and intentions by soliciting feedback from consumers.

Students will collaborate with others to assume shared responsibility for collaborative work, and value the individual contributions made by each team member when completing tasks in small groups or as a class.
Students will understand, negotiate and balance diverse views and beliefs to reach workable solutions, particularly in multi-cultural environments.
Students will reason effectively and make decisions when applying their knowledge, examining farm activities, and conducting investigations.
Through implementing and evaluating the results of work and farm plans, students will analyze how part of a whole interact with each other to produce overall outcomes in complex systems.
Students will produce results in a farm setting and meet production goals by working collaboratively.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards
PS.01.01. Classify agricultural plants according to taxonomy systems.
PS.01.01.02.b. Identify agriculturally important plants by common names.
PS.01.02. Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.
PS.01.02.05.c. Apply the knowledge of flower structures to plant breeding, production and use.
PS.01.03. Apply knowledge of plant physiology and energy conversion to plant systems.
PS.02.01: Determine the influence of environmental factors on plant growth.
PS.02.01.02.b. Determine the optimal air, temperature and water conditions for plant growth.
PS.02.02. Prepare growing media for use in plant systems.
PS.02.03. Develop and implement a fertilization plan for specific plants or crops.
PS.02.03.04.b. Calculate the amount of fertilizer to be applied and to apply the prescribed amount of fertilizer.
PS.03.01. Demonstrate plant propagation techniques.
PS.03.01.02.a. Demonstrate sowing techniques and provide favorable conditions for seed germination.
PS.03.02.: Develop and implement a plant management plan for crop production.
PS.03.02.01.b. Inspect propagation material for evidence of pests or disease.
PS.03.02.02.b. Prepare soil for planting with the addition of amendments.
PS.03.02.04.b. Monitor the progress of plantings and determine the need to adjust environmental conditions.
PS.03.02.05.a. Explain the reasons for controlling plant growth.
PS.03.02.05.b. Demonstrate proper techniques to control and manage plant growth through mechanical, cultural or chemical means.
PS.03.04. Apply principles and practices of sustainable agriculture to plant production.
PS.03.04.01.b. Describe sustainable agriculture practices and compare the ecological effects of traditional agricultural practices with those of sustainable agriculture.
PS.03.04.01.c. Prepare and implement a plan for an agricultural enterprise that involves practices in support of sustainable agriculture.
PS.03.05. Harvest, handle and store crops.
PS.03.05.01.b. Assess the stage of growth to determine crop maturity or salability and demonstrate proper harvesting techniques.
PS.03.05.02.c. Implement plans to reduce crop loss.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):
HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
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.
HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Washington English Language Arts Standards (Common Core State Standards)

RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

RST.9-10.10 By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

Unit 9: Communication and Leadership	Total Learning Hours for Unit: 10

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Explore the role of leadership in agricultural careers through research and discussions.
- Identify what is good communication in both written and verbal form within agricultural careers and develop documentation that allows them to most effectively reach specific audiences for particular purposes.
- Lead groups in various tasks
- Speak in front of class and other groups
- Co-create a community contract outlining group norms
- Give and receive constructive feedback using “Straight Talk” model
- Engage in and debrief team-building activities
- Demonstrate personal responsibility through timeliness and follow-through.
- Appreciate and show active respect for cultural diversity.
- Show their understanding of farm knowledge by giving informational farm tours to the public.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will interact effectively with others through team-building and group projects.
Students will work effectively in diverse teams through practice of non-violent and collaborative communication and seeking feedback from other students via Straight Talk.
Students will produce results in a farm setting and meet production goals by working collaboratively.
Students will demonstrate their ability to manage goals and time while leading groups, and demonstrating timeliness and follow-through.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards

CS.01.03. Performance Indicator: Vision: Establish a clear image of what the future should look like.
CS.01.05. Performance Indicator: Awareness: Desire purposeful understanding related to professional and personal activities.
CS.02.03. Performance Indicator: Professional Growth: Develop awareness and apply skills necessary for achieving career success.
CRP.01. Act as a responsible and contributing citizen and employee.
CRP.01.01.02.b. Assess personal level of responsibility and examine opportunities for improvement.
CRP.01.01.02.c. Model personal responsibility in workplace and community situations.
CRP.04.03. Model active listening strategies when interacting with others in formal and informal settings.
CRP.04.03.01.b. Apply active listening strategies (e.g., be attentive, observe non-verbal cues, ask clarifying questions, etc.).
CRP.04.03.02.c. Model active listening strategies in formal and informal settings.
CRP.09.01. Model characteristics of ethical and effective leaders in the workplace and community (e.g. integrity, self-awareness, self-regulation, etc.).
CRP.09.01.01.a. Identify and summarize the characteristics of ethical and effective leaders in workplace and community settings.
CRP.09.01.02.b. Conduct a self-assessment of personal ethical and effective leadership characteristics (e.g., relates to others, focused, integrity, etc.) and reflect upon the results to identify opportunities for improvement.
CRP.09.01.02.c. Model characteristics and actions of ethical and effective leaders in workplace and community situations (e.g., integrity, self-awareness, etc.).
CRP.12.02. Create and implement strategies to engage team members to work toward team and organizational goals in a variety of workplace and community situations (e.g., meetings, presentations, etc.).
CRP.12.02.01.a. Identify and summarize effective strategies used to engage team members to accomplish goals.
CRP.12.02.02.a. Examine and summarize workplace and community situations where it is important to engage team members to meet team and organizational goals (e.g., meetings, presentations, etc.).
CRP.12.02.01.b. Assess team dynamics and match strategies to increase team member engagement.
CRP.12.02.01.c. Create and implement novel strategies to engage team members based on the situation.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

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.

Washington English Language Arts Standards (Common Core State Standards)

WHST.9-10.1D Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
WHST.9-10.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

21st Century Skills		
Students will demonstrate in this course:		
LEARNING & INNOVATION **Creativity and Innovation** ☒Think Creatively ☒Work Creatively with Others ☒Implement Innovations **Critical Thinking and Problem Solving** ☒Reason Effectively ☒Use Systems Thinking ☒Make Judgments and Decisions ☒Solve Problems **Communication and Collaboration** ☒Communicate Clearly ☒Collaborate with Others	**INFORMATION, MEDIA & TECHNOLOGY SKILLS** **Information Literacy** ☒Access and Evaluate Information ☒Use and Manage Information **Media Literacy** ☒Analyze Media ☒Create Media Products **Information, Communications and Technology (ICT Literacy)** ☒Apply Technology Effectively	**LIFE & CAREER SKILLS** **Flexibility and Adaptability** ☒Adapt to Change ☒Be Flexible **Initiative and Self-Direction** ☒Manage Goals and Time ☒Work Independently ☒Be Self-Directed Learners **Social and Cross-Cultural** ☒Interact Effectively with Others ☒Work Effectively in Diverse Teams **Productivity and Accountability** ☒Manage Projects ☒Produce Results **Leadership and Responsibility** ☒Guide and Lead Others ☒Be Responsible to Others

Statewide Framework Document for: 011001

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.

Food Science and Safety

Course Title: Food Science and Safety		**Total Framework Hours: 180**
CIP Code: 011001	☒ **Exploratory** ☐ **Preparatory**	**Date Last Modified: April 25, 2016**
Career Cluster: Agriculture, Food, and Natural Resources		**Cluster Pathway: Food Products and Processing**
Eligible for Equivalent Credit in: ☐ **Math** ☒ **Science**		**Total Number of Units: 7**

Course Overview

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).

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:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- 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:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

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

Industry Standards and 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 Standards

Washington Science Standards (Next Generation Science Standards):

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.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking Questions and Defining Problems	LS1.B. Growth and Development of Organisms	Structure and Function
Planning and Carrying Out Investigations		Cause and Effect: Mechanism and Prediction
Analyzing and Interpreting Data		Systems and System Models
Obtaining, Evaluating, and Communicating Information		Structure and Function

Common Core: English Language Arts Standards – Science and Technical Subjects

RST.11-12.2 – Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.3 – Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.11-12.4 – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.7 – Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.8 – Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

RST.11-12.10 – By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

Common Core: English Language Arts Standards – Writing

WHST.11-12.2 – Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
WHST.11-12.4 – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.6 – Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
WHST.11-12.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.10 – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

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:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- 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 CO_2 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:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

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

Industry Standards and 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.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 Standards

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).

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

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking Questions and Defining Problems	PS1B Chemical Reactions	Patterns
Analyzing and Interpreting Data	PS2B Types of Interactions	Cause and Effect: Mechanism and Prediction
		Structure and Function
		Stability and Change

CCSS: English Language Arts Standards » Science & Technical Subjects

RST.11-12.3 – Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.11-12.4 – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.10 – By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

CCSS: English Language Arts Standards » Writing

WHST.11-12.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8 – Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.10 – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

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:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- 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:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

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

Industry Standards and 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 Standards

Washington Science Standards (Next Generation Science Standards):

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

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL		
Science and Engineering Practice	**Disciplinary Core Idea**	**Crosscutting Concept**
Asking Questions and Defining Problems	ETS1. A Defining and Delimiting Engineering Problems	Patterns
Developing and Using Models	ETS1.B Developing Possible Solutions	Cause and Effect: Mechanism and Prediction
Analyzing and Interpreting Data	ETS1.C Optimizing the Design Solution	Systems and System Models
Engaging in Argument from Evidence	LS1.A Structure and Function	Structure and Function
Obtaining, Evaluating, and Communicating Information		
Planning and Carrying Out Investigations		
Constructing Explanations and Designing Solutions		

CCSS: English Language Arts Standards » Science & Technical Subjects
RST.11-12.3 – Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.11-12.4 – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.7 – Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.9 – Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
RST.11-12.10 – By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

CCSS: English Language Arts Standards » Writing
WHST.11-12.1 – Write arguments focused on discipline-specific content.
WHST.11-12.2 – Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
WHST.11-12.4 – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.6 – Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
WHST.11-12.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8 – Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9 – Draw evidence from informational texts to support analysis, reflection, and research.
WHST.11-12.10 – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 4: Food Processing Preservation and Packaging	Total Learning Hours for Unit: 25

Unit Summary:

This unit will include instruction on Processing and Consumption, Processing for Preservation, Processing for Quality and Safety

4.1 Processing is a system that physically or chemically changes the inherent characteristics of agricultural products prior to consumption.
4.2 Specific unit operations are dependent upon the chemical and physical properties of the raw food commodity.
4.3 Processing methods are dependent upon the end uses of the agricultural products.
4.4 Agricultural commodities are processed and separated into components used for further processing or for consumption.
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.
4.6 Food preservation controls microbial growth and enzymatic reactions, extending the shelf life of a food while changing its quality and usability.
4.7 A variety of federal, state, and local agencies govern the manufacture and sale of food.
4.8 Agricultural commodities are graded based on their quality and usability, triggering some food products to have quality grading standards.
4.9 Certain food products must meet legal standards of identity.

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- 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:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

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

Industry Standards and 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 Standards

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

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL		
Science and Engineering Practice	**Disciplinary Core Idea**	**Crosscutting Concept**
Asking Questions and Defining Problems	**PS1. B Chemical Reactions**	**Stability and Change**
Constructing Explanations and Designing Solutions		**Cause and Effect: Mechanism and Prediction**
Analyzing and Interpreting Data		**Systems and System Models**
Planning and Carrying Out Investigations		**Structure and Function**
Obtaining, Evaluating, and Communicating Information		**Patterns**

CCSS: English Language Arts Standards » Science & Technical Subjects »
RST.11-12.1 – Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.3 – Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.11-12.4 – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.7 – Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.8 – Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
RST.11-12.9 – Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
RST.11-12.10 – By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

CCSS: English Language Arts Standards » Writing » Grade 11-12
WHST.11-12.2 – Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
WHST.11-12.4 – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5 – Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 – Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
WHST.11-12.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8 – Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9 – Draw evidence from informational texts to support analysis, reflection, and research.
WHST.11-12.10 – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 5: Food Health and Security	Total Learning Hours for Unit: 20

Unit Summary
The unit will include instruction Nourishing Nutrition Labels, Safe, Secure, and Accessible

5.1 Food labels provide required and useful information, such as ingredients, nutrition, claims, traceability, warnings, and proper food handling for consumers.
5.2 Recommended dietary allowances provide guidelines for proper intake of macromolecules for health depending upon gender and different life stages.
5.3 Foods are analyzed and labeled based on their composition of various molecules.
5.4 Safe and nutritious food, necessary to maintain health, is not equally accessible to everyone.
5.5 U.S. food supply needs protection from intentional adulteration.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- 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.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will access and evaluate information utilizing food labels.

Industry Standards and 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.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.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 Standards

Washington Science Standards (Next Generation Science Standards):

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.
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.
HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
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.
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.
HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
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.

CCSS: English Language Arts Standards » Science & Technical Subjects »

RST.11-12.3 – Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.11-12.4 – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.7 – Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.11-12.10 – By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

CCSS: English Language Arts Standards » Writing » Grade 11-12
WHST.11-12.1 – Write arguments focused on discipline-specific content.
WHST.11-12.2 – Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
WHST.11-12.4 – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.6 – Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
WHST.11-12.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8 – Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.10 – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 6: Preference and Product Availability	Total Learning Hours for Unit: 25

Unit Summary:
This unit will include instruction in Consumer Preferences, To Protect and Sell

6.1 Consumers choose food based on lifestyle factors including price, availability, convenience, culture, and nutrition.
6.2 Sensory evaluations must be carefully constructed and executed to reduce factors or biases that are not relevant to the test objective.
6.3 Different sensory evaluation techniques determine consumer preference and acceptance.
6.4 Food marketing uses technology and media to influence consumer behavior.
6.5 Food packaging both protects food and attracts consumers.
6.6 Food retailers position products based on shopping behaviors and consumer trends.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- 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.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will communicate clearly and work effectively in diverse teams to evaluate marketing strategies.

Industry Standards and 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.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 Standards

Washington Science Standards (Next Generation Science Standards):

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.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking Questions and Defining Problems	ETS1.A Defining and Delimiting Engineering Problems	Cause and Effect: Mechanism and Prediction

Planning and Carrying Out Investigations	ETS1.B Developing Possible Solutions	Systems and System Models
Obtaining, Evaluating, and Communicating Information	ETS1.C Optimizing the Design Solution	Structure and Function
Developing and Using Models		Stability and Change
Analyzing and Interpreting Data		
Constructing Explanations and Designing Solutions		

CCSS: English Language Arts Standards » Science & Technical Subjects »
RST.11-12.1 – Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.3 – Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.11-12.4 – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.7 – Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CCSS: English Language Arts Standards » Writing » Grade 11-12
WHST.11-12.2 – Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
WHST.11-12.4 – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.6 – Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
WHST.11-12.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8 – Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9 – Draw evidence from informational texts to support analysis, reflection, and research.
WHST.11-12.10 – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 7: Food Product Development	Total Learning Hours for Unit: 25

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.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- 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.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will think creatively, implement innovation, and communicate clearly developing and producing their new food product.

Industry Standards and 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.
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 Standards

Washington Science Standards (Next Generation Science Standards):

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.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking Questions Defining Problems	ETS1.A Defining and Delimiting Engineering Problems	Cause and Effect: Mechanism and Prediction
Developing and Using Models	ETS1.B Developing Possible Solutions	Systems and System Models
Planning and Carrying Out Investigations	ETS1.C Optimizing the Design Solutions	Structure and Function
Analyzing and Interpreting Data		Stability and Change
Constructing Explanations and Designing Solutions		
Obtaining , Evaluating, and Communicating Information		

CCSS: English Language Arts Standards » Science & Technical Subjects »
RST.11-12.1 – Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.3 – Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.11-12.4 – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.7 – Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.9 – Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
RST.11-12.10 – By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

CCSS: English Language Arts Standards » Writing » Grade 11-12
WHST.11-12.2 – Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
WHST.11-12.4 – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.6 – Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
WHST.11-12.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

WHST.11-12.8 – Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9 – Draw evidence from informational texts to support analysis, reflection, and research.
WHST.11-12.10 – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

21st Century Skills

Students will demonstrate in this course:

LEARNING & INNOVATION	INFORMATION, MEDIA & TECHNOLOGY SKILLS	LIFE & CAREER SKILLS
Creativity and Innovation ☒Think Creatively ☒Work Creatively with Others ☒Implement Innovations **Critical Thinking and Problem Solving** ☒Reason Effectively ☐Use Systems Thinking ☒Make Judgments and Decisions ☒Solve Problems **Communication and Collaboration** ☒Communicate Clearly ☒Collaborate with Others	**Information Literacy** ☒Access and Evaluate Information ☒Use and Manage Information **Media Literacy** ☐Analyze Media ☐Create Media Products **Information, Communications and Technology (ICT Literacy)** ☒Apply Technology Effectively	**Flexibility and Adaptability** ☒Adapt to Change ☐Be Flexible **Initiative and Self-Direction** ☐Manage Goals and Time ☒Work Independently ☒Be Self-Directed Learners **Social and Cross-Cultural** ☐Interact Effectively with Others ☒Work Effectively in Diverse Teams **Productivity and Accountability** ☐Manage Projects ☐Produce Results **Leadership and Responsibility** ☐Guide and Lead Others ☒Be Responsible to Others

Statewide Framework Document for: 030104- AP ENVIRONMENTAL SCIENCE

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.

AP Environmental Science

Course Title: AP Environmental Science	**Total Framework Hours: 180**
CIP Code: 030104 ☒**Exploratory** ☐**Preparatory**	**Date Last Modified: 4/11/2016**
Career Cluster: Agriculture, Food, and Natural Resources	**Cluster Pathway: Environmental Service System**
Eligible for Equivalent Credit in: ☐ **Math** ☒ **Science**	**Total Number of Units: 8**

Course Overview

Summary:
A course that focuses on the application of biological, chemical, and physical principles to the study of the physical environment and the solution of environmental problems, including subjects such as abating or controlling environmental pollution and degradation; the interaction between human society and the natural environment; alternative energy, and natural resources management. Includes instruction in biology, chemistry, physics, geosciences, climatology, statistics, and mathematical modeling.

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).

Unit 1: Earth Systems and Resources	Total Learning Hours for Unit: 25

Unit Summary:

This unit will focus on Earth Science Concepts, The Atmosphere, Global Water Resources and Use, and Soil and Soil Dynamics.

A. Earth Science: Geological time scale, plate tectonics, earthquakes, volcanism, seasons, solar intensity and latitude
B. The Atmosphere: Composition, structure, weather and climate, atmospheric circulation and the Coriolis Effect, atmosphere-ocean interactions; ENSO
C. Global Water Resources and Use: Freshwater/saltwater; ocean circulation; agricultural, industrial, and domestic use; surface and groundwater issues; global problems; conservation
D. Soil and Soil Dynamics: Rock cycle; formation; composition; physical and chemical properties; main soil types; erosion and other soil problems; soil conservation

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Identify renewable and nonrenewable resources in the Pacific Northwest region.
- Explain how human use of natural resources stress natural processes and link that use to a possible long term consequence.
- Students will define the role water plays in the environment
- Draw and label the 8 components of the hydrologic cycle, including the energy source.
- Soil Formation and Properties Lab-students learn how rocks are weathered to create soil, analyze soil horizons, determine land slope, identify soil composition and calculate bulk density.
- Porosity and Drainage rate of Soils Lab—students use a variety of substances such as sand, gravel and soil to measure porosity and drainage rates.
- Chemistry of Soil Lab—students use a test kit to determine the Nitrate, Phosphate and pH levels in various samples of soil they have collected.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will access and evaluate information and produce results while completing the chemistry of soil lab.

Industry Standards and Competencies

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

NRS.01.01.01.a. Summarize and classify the different kinds of natural resources using common classification schemes.
NRS.01.03.01.a. Classify different kinds of biochemical cycles and the role they play in natural resources systems.
ESS.03.01.01.a. Identify components and structural layers of the earth's atmosphere.
CS.01.01.04.c. Create resources to complete an action or project.
CS.01.02.02.c. Engage others in conversations to respond to an obstacle when completing a task.
ESS.02.01.01.b. Identify the purposes of laws associated with environmental service systems.
ESS.03.02.03.b. Identify the physical qualities of the soil that determine its use for environmental service systems.
ESS.03.02.02.b. Relate the activities of microorganisms in soil to environmental service systems.
ESS.05.01.01.c. Evaluate the impact the burning of fossil fuels has on the environment.
ESS.05.01.02.c. Evaluate the impact of alternative energy sources on the environment.
CS.01.01.04.c. Create resources to complete an action or project.

CS.01.02.02.c. Engage others in conversations to respond to an obstacle when completing a task.
ESS.03.02. Apply soil science and hydrology principles to environmental service systems.

Aligned Washington State Standards

Environmental and Sustainability Standards
ESE Standard 1: Ecological, Social, and Economic Systems. Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.
ESE Standard 2: The Natural and Built Environment: Students engage in inquiry and systems thinking and use information gained through experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.
ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability

Washington State Science Standards:
HS-ESS1- 5. Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
HS-ESS2-1. Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
HS-ESS2-7 Construct an argument based on evidence about the simultaneous co-evolution of Earth's systems and life on Earth.
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-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Unit 2: The Living World | Total Learning Hours for Unit: 25

Unit Summary:
This unit will include instruction on Ecosystem Structure, Energy Flow, Ecosystem Diversity, Natural Ecosystem Change, and Natural Biogeochemical Cycles.
A. Ecosystem Structure: Biological populations and communities; ecological niches; interactions among species; keystone species; species diversity and edge effects; major terrestrial and aquatic biomes
B. Energy Flow: Photosynthesis and cellular respiration; food webs and trophic levels; ecological pyramids
C. Ecosystem Diversity: Biodiversity; natural selection; evolution; ecosystem services
D. Natural Ecosystem Change: Climate shifts; species movement; ecological succession
E. Natural Biogeochemical Cycles: Carbon, nitrogen, phosphorus, sulfur, water, conservation of matter

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:
- Create a travel brochure for a specific biome. Include analysis of altitude, the role of geochemical cycles, food webs, and keystone species within that biome.

- Explain how climate shift leads to ecological succession via natural selection.
- Case Study: Study current research on how climate shift is affecting a specific species (i.e. polar bears)
- Ecocolumn lab—students set up mini ecosystems, observe the changes over several weeks, test water quality, and analyze the health of their ecosystem.
- Benthic Macro invertebrate lab

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will think creatively, work in diverse teams, and communicate clearly to complete case studies related to the living world and share their findings with their peers.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards -
ESS.03.04. Apply microbiology principles to environmental service systems.
ESS.03.05. Apply ecology principles to environmental service systems.
ESS.03.04.01.b. Assess how the activities of microorganisms in soil affect environmental service systems and ecosystem biodiversity.
ESS.03.05.01.c. Evaluate the biodiversity of an area and predict the impact of changing the levels of biodiversity on environmental service systems.
ESS.03.05.02.c. Evaluate the importance of habitat to environmental service systems and devise strategies to minimize the future loss of habitats.
ESS.03.05.02.b. Assess the impact of the current rate of habitat loss on environmental service systems.
ESS.03.05.03.b. Assess and describe the impact of a population exceeding its carrying capacity on environmental service systems.
ESS.03.05.03.a. Research and explain how carrying capacities relate to environmental service systems (e.g., waste processing, rate or production of pollution, disease, etc.).
ESS.03.05.02.a. Examine and explain the role played by habitats on environmental service systems.
ESS.03.05.04.b. Evaluate the benefits and drawbacks of using bioindicator species in environmental service systems.

Aligned Washington State Standards

Environmental and Sustainability Standards
ESE Standard 1: Ecological, Social, and Economic Systems. Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.
ESE Standard 2: The Natural and Built Environment: Students engage in inquiry and systems thinking and use information gained through experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.
ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability.

Washington Science Standards (Next Generation Science Standards):
HS-LS1-5: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
HS-LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales
HS-LS2-3: Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

HS-LS2-5: Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity
HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS-LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
HS-LS4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
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-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- ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Unit 3: Populations	**Total Learning Hours for Unit: 20**

Unit Summary:
This unit will include instruction on Population Biology Concepts and Human Populations

A. Population Biology Concepts: Population ecology; carrying capacity; reproductive strategies; survivorship
B. Human population dynamics: Historical population sizes; distribution; fertility rates; growth rates and doubling times; demographic transition; age-structure diagrams
C. Population size: Strategies for sustainability; case studies; national policies
D. Impacts of population growth: Hunger; disease; economic effects; resource use; habitat destruction

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- *Evaluate* the conditions necessary for rapid *population growth* (e.g., given adequate living and nonliving resources and no disease or predators, *populations* of an *organism* increase at rapid rates).
- Given *ecosystem* data, calculate the *population density* of an *organism*.
- Analysis of a Sustainability case study
- Policy Paper: Analyze human population growth and related policies in a specific region of the world. Consider resource availability and use as well as issues of disease.
- Population Density and Biomass Lab
- Duckweed Lab—students grow duckweed over 30 days in distilled vs. saline water, record growth rate, record the carrying capacity and mathematically calculate whether the difference in growth rate is significant.
- Natural Selection Lab—shows population change
- Case Studies: Yellowstone wolves, Kaibab deer, Lynx/Hare dynamic, China, Rapa Nui (Easter Island)
- Videos: Farming for Future video, Hunger Banquet video, Hungry Planet video
- Nations Report—students choose a nation from list, research and make a poster showing population dynamics of that nation.
- Activity: Sugar Cube population growth—a modeling activity to demonstrate exponential growth and impact of birth/death rates
- Explain and apply the fundamentals of demography

- Outline and assess the concept of demographic transition
- Population Math—students use formulas to calculate growth rates, death rates etc.
- Population Growth (POGIL)
- Population Growth INVESTIGATION
- Colony Collapse Disorder and an Analysis of Honey Bee Colony Numbers (NGSS Classroom Task)
- Carrying Capacity, Human population, Natural Resources, and Biodiversity PROJECT

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will make judgements and decisions, implement innovations, and communicate clearly while researching, analyzing, and presenting findings related to policy related sustainability.

Industry Standards and Competencies

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

NRS.01.06.01.a. Differentiate between population ecology, population density and population dispersion and describe the importance of these concepts to natural resource systems.
NRS.01.06.01.b. Analyze the factors that influence population density and population dispersion in natural resource systems.
ESS.02.02. Compare and contrast the impact of current trends on regulation of environmental service systems (e.g., climate change, population growth, international trade, etc.).
ESS.02.02.01.a. Research and categorize the purpose, implementation and impact of greenhouse gas emission policies (e.g., cap-and-trade, emission offsetting, zero-emissions, carbon-neutrality, carbon sequestration, etc.).
ESS.02.02.02.a. Research the impact of environmental service systems regulations on international trade.
ESS.02.02.03.a. Examine and summarize the impact that population growth has on environmental service systems.
ESS.02.02.03.b. Analyze the correlation between increased population size and the need for regulation of environmental service systems.
ESS.02.02.03.c. Predict the impact of future population growth on the regulation of environmental service systems and evaluate how changes made today will impact future regulations.

Aligned Washington State Standards

Environmental and Sustainability Standards

ESE Standard 1: Ecological, Social, and Economic Systems. Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.
ESE Standard 2: The Natural and Built Environment: Students engage in inquiry and systems thinking and use information gained through experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.
ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability

Washington Science Standards (Next Generation Science Standards):

HS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem
HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
HS-ETS1-3 Evaluate a solution to complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Constructing Explanations and Designing Solutions	PS3.A: Definitions of Energy	Cause and Effect

Unit 4: Land and Water Use | Total Learning Hours for Unit: 25

Unit Summary:
This unit will include instruction in agriculture, forestry, rangelands, and other land use
A. Agriculture: Feeding a growing population: Human nutritional requirements; types of agriculture; Green Revolution; genetic engineering and crop production; deforestation; irrigation; sustainable agriculture)
B. Agriculture: Controlling pests: Types of pesticides; costs and benefits of pesticide use; integrated pest management; relevant laws
C. Forestry: Tree plantations; old growth forests; forest fires; forest management; national forests
D. Rangelands: Overgrazing, deforestation, desertification, rangeland management, federal rangelands
E. Urban Land Development: Planned development, suburban sprawl, urbanization
F. Transportation infrastructure: Federal Highway system, canals and channels, roadless areas, ecosystem impacts
G. Public and federal lands: Management, wilderness areas, national parks, wildlife refuges, forests, wetlands
H. Land conservation options: Preservation, remediation, mitigations, restoration, Sustainable land-use strategies.
I. Mining: mineral formation, extraction, global reserves, relevant laws and treaties
J. Fishing: fishing techniques, overfishing, aquaculture, relevant laws and treaties
K. Global Economics: Globalization, World Bank, Tragedy of the Commons, relevant laws and treaties

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:
- Define the role water plays in the environment.
- Correlate how history has impacted natural resources use and management
- Distinguish the roles animals play in the forest and will identify ways to improve wildlife habitat.
- Where Did the Water Go?: Watershed Study (NGSS Classroom Task)

- Salinization Lab – students germinate lettuce seeds in a variety of salt concentrations to determine the threshold for soil in terms of salt content – implication for farmers.
- Water Quality Testing (S.A.E.) – various field experiences throughout the year to determine pH, temperature, dissolved oxygen, nitrates, turbidity, and salinity.
- Land Use Activity – Given certain parameters, students will design an environmentally friendly township and present it to the class.
- Agricultural Practices, Soil and Biodiversity Project
- Exam in Water, Agriculture, and Land Use
- Labs: Salinization, DNA Depot, Cookie Mining, Serotinous Cone Lab, Water Quality Testing, Ocean Science, Oil Spill
- Case Studies: Central Case: Plumbing the Colorado River, Central Case: Seeding the Seas with Marine Reserves

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will use and manage information, manage goals and time, and produce results when presenting solutions to land use issues.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards -
NRS.01.04.02.a. Examine and describe the importance of ground water and surface water to natural resources.
NRS.01.05.02.a. Compare and contrast techniques associated with soil management.
NRS.02.03.01.a. Summarize and categorize the different social considerations in regards to the use of natural resources.
NRS.02.03.01.b. Analyze how social considerations can affect the use and sustainability of natural resources.
ESS.02. Evaluate the impact of public policies and regulations on environmental service system operations.
ESS.02.01. Interpret and evaluate the impact of laws, agencies, policies and practices affecting environmental service systems.
ESS.02.01.01.c. Evaluate the impact of laws associated with environmental service systems for their impact on wildlife, people, the environment and the economy.

Aligned Washington State Standards

Environmental and Sustainability Standards
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ESE Standard 2: The Natural and Built Environment: Students engage in inquiry and systems thinking and use information gained through experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.
ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability

Washington Science Standards (Next Generation Science Standards):
HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems
HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Unit 5: Energy Resources and Consumption	Total Learning Hours for Unit: 25

Unit Summary

This unit will include instruction in Energy Concepts, Energy Consumption, Fossil Fuels Resources and Use, Nuclear Energy, Hydroelectric Power, Energy Conservation, and Renewable Energy

A. Energy Concepts: Energy forms; power; units; conversions; Laws of Thermodynamics
B. Energy Consumption: History; Industrial Revolution; exponential growth; energy crisis, Present global energy use, Future energy needs
C. Fossil Fuel Resources and Use; Formation of coal, oil, and natural gas; extraction/purification methods; world reserves and global demand; synfuels; environmental advantages/disadvantages of sources
D. Nuclear Energy: Nuclear fission process; nuclear fuel; electricity production; nuclear reactor types; environmental advantages/disadvantages; safety issues; radiation and human health; radioactive wastes; nuclear fusion
E. Hydroelectric Power: Dams; flood control; salmon; silting; other impacts
F. Energy Conservation: Energy efficiency; CAFE standards; hybrid electric vehicles; mass transit
G. Renewable Energy: Solar energy; solar electricity; hydrogen fuel cells; biomass; wind energy; small-scale hydroelectric; ocean waves and tidal energy; geothermal; environmental advantages/disadvantages

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- *Explain how* scientific *concepts* and findings relate to a resource issue currently under discussion in the state of Washington (e.g., removal of dams to facilitate salmon spawning in rivers; construction of *wind* farms).
- *Explain how* the *concept* of *sustainable development* may be applied to a current resource issue in the state of Washington, the U.S. and the World.
- Labs: Burn oil to measure heat and toxic fumes, Solar panel cookers lab, Capturing the Wind Lab
- Videos: Get Energized DVD, Balancing Coal and the Environment, “Who killed the electric car?,” “Future Cars”
- Case Studies: Central Case: Alaska’s North Slope, Central Case: Sweden’s Search for Alternative Energy Central Case

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will interact effectively with others, guide and lead others, and work effectively in diverse teams to work to design solutions to energy resource issues.

Industry Standards and Competencies

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

NRS.01.01.01.a. Summarize and classify the different kinds of natural resources using common classification schemes.
NRS.01.03.02.a. Research and summarize how climate factors influence natural resource systems.
NRS.01.03.02.b. Analyze the impact that climate has on natural resources and debate how this impact has changed due to human activity.
NRS.03.01.03.a. Compare and contrast the cost and benefits of mineral extraction to the local, state and/or national economy.
NRS.03.01.04.a. Compare and contrast the cost and benefits of fossil fuels to the local, state and/or national economy.

NRS.03.01.05.a. Compare and contrast the cost and benefits of shale oil from fracking to the local, state and/or national economy.
NRS.03.01.06.a. Compare and contrast the cost and benefits of alternative sources of energy
ESS.04.04. Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental service systems.
ESS.04.04.01.a. Research conventional energy sources and list conservation measures to reduce the impact on environmental service systems.
ESS.04.04.01.b. Assess the advantages and disadvantages of conventional energy sources in regards to environmental service systems.
ESS.04.04.02.a. Research alternative energy sources and describe the motivations for seeking alternatives to conventional energy sources as they relate to environmental monitoring.
ESS.04.04.02.b. Identify advantages and disadvantages of alternative energy sources as they pertain to environmental service systems.
ESS.04.04.02.c. Evaluate the impact alternative energy sources have on environmental conditions.
ESS.04.04.04.a. Research the impact on environmental service systems that occur because of energy consumption.
ESS.04.04.05.a. Examine and explain how energy consumption and the carbon cycle relate to environmental monitoring.
ESS.04.04.05.b. Calculate the impact of the carbon cycle imbalance (due to energy consumption) and assess how this imbalance affects environmental service systems.

Aligned Washington State Standards

Environmental and Sustainability Standards
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ESE Standard 2: The Natural and Built Environment: Students engage in inquiry and systems thinking and use information gained through experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.
ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability

Washington Science Standards (Next Generation Science Standards):
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-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Unit 6: Pollution	Total Learning Hours for Unit: 35

Unit Summary
This unit will include instruction in Pollution Types, Impacts on the Environment and Human Health, and Economic Impacts
A. Air pollution: Sources — primary and secondary; major air pollutants; measurement units; smog; acid deposition — causes and effects; heat islands and temperature inversions; indoor air pollution; remediation and reduction strategies; Clean Air Act and other relevant laws
B. Noise pollution: Sources; effects; control measures
C. Water pollution: Types; sources, causes, and effects; cultural eutrophication; groundwater pollution; maintaining water quality; water purification; sewage treatment/septic systems; Clean Water Act and other relevant laws
D. Solid waste: Types; disposal; reduction
E. Hazards to human health: Environmental risk analysis; acute and chronic effects; dose-response relationships; air pollutants; smoking and other risks

F. Hazardous chemicals in the environment: Types of hazardous waste; treatment/disposal of hazardous waste; cleanup of contaminated sites; biomagnification; relevant laws)
G. Economic Impacts: Cost-benefit analysis; externalities; marginal costs; sustainability

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Give an example of a physical, biological and chemical parameter that we monitor to manage water quality.
- Explain the role for green urban planning work to lower pollution.
- Labs: Consumer evaluation lab—Household Hazardous Waste, LC-50 Lab, Acid Rain, Exploring Air Pollution Generated by Fossil Fuels, Air Quality survey, Air pollution assay, Landfill Decomposition,
- Slime INVESTIGATION – Students develop a water purification system to purify a sample of mysteriously contaminated water.
- Eco-Column INVESTIGATION – Students learn how biogeochemical cycles work within a closed system.
- Exams in Air & Water Pollution and Solid Waste
- Case Studies: Central Case: Endocrine Disrupters, London's Killer Smog
- Videos: Health Effects of Smog, EPA Pay as you Throw, Time and Again
- Risk assessment activity
- 10 Sources of Indoor Air Pollution handout
- Field trip-to LRI landfill/recycling center on S. Meridian, Graham
- Recycle City –website in computer lab

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will collaborate with others, access and evaluate information, and apply technology effectively while determining human health hazards and potential economic impacts of these hazards.
Students will be self-directed learners while completing environmental health related investigations.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards -
NRS.01.03.01.a. Classify different kinds of biogeochemical cycles and the role the play in natural resources systems.
ESS.04. Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).
ESS.04.01. Use pollution control measures to maintain a safe facility and environment.
ESS.04.01.01.a. Identify and distinguish types of pollution and distinguish between point source and nonpoint source pollution.
ESS.04.01.01.b. Assess how industrial and nonindustrial pollution has damaged the environment.
ESS.04.01.01.c. Evaluate evidence for a given area for industrial and nonindustrial pollution.
ESS.04.01.02.a. Research ways in which pollution can be managed and prevented and propose solutions to meet the needs of local systems.
ESS.04.01.02.b. Conduct tests to determine the presence and extent of pollution.
ESS.04.01.02.c. Create a plan for pollution remediation, management or prevention for a given area.

ESS.04.01.03.a. Interpret the conditions necessary for waste to be labeled as hazardous.
ESS.04.01.03.b. Classify examples of pollution as hazardous or nonhazardous.
ESS.04.03. Apply techniques to ensure a safe supply of drinking water and adequate treatment of wastewater according to applicable rules and regulations.

Aligned Washington State Standards

Environmental and Sustainability Standards
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ESE Standard 2: The Natural and Built Environment: Students engage in inquiry and systems thinking and use information gained through experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.
ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability

Washington Science Standards (Next Generation Science Standards):
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-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems

Unit 7: Global Change	Total Learning Hours for Unit: 20

Unit Summary
This unit will include instruction in Stratospheric Ozone, Global Warning, and Loss of Biodiversity

A. Stratospheric Ozone: Formation of stratospheric ozone; ultraviolet radiation; causes of ozone depletion; effects of ozone depletion; strategies for reducing ozone depletion; relevant laws and treaties
B. Global Warming: Greenhouse gases and the greenhouse effect; impacts and consequences of global warming; reducing climate change; relevant laws and treaties
C. Loss of Biodiversity: Habitat loss; overuse; pollution; introduced species; endangered and extinct species, Maintenance through conservation, Relevant laws and treaties

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- *Explain that* Earth is warmer near the equator and cooler near the poles due to the uneven heating of Earth by the Sun.
- *Explain that* it's warmer in summer and colder in winter for people in Washington State because the intensity of sunlight is greater and the days are longer in summer than in winter. Connect these seasonal changes in sunlight to the tilt of Earth's axis with respect to the plane of its *orbit* around the Sun
- *Explain how* the *climate* in the Pacific Northwest region is affected by seasonal weather *patterns*, as well as other *factors* such as the addition of greenhouse *gases* to the *atmosphere* and proximity to mountain ranges and to the ocean.

- *Describe factors* that change climates over long periods of time and cite methods that scientists have found to gather information on ancient climates.
- Design a conservation and critique program
- Evaluate the human impact on the environment by calculating carbon Footprint
- A Tale of Four Cities: Using Data to Model Variations in Regional Climate in the Western United States (NGSS Classroom Task)
- Analyzing Floods: Understanding Past Flood Events and Considering Future Flood Events in a Changing Climate (NGSS Classroom Task)
- Human Activity & Global Climate Change PROJECT (ESSS2-4, ESS3-3, and ESS3-6)
- Exams on Global Change & Sustainability
- Lab:Ice Cubes Lab
- Case Study: Central Case-Rising Temperatures and Seas may take the Maldives Under
- Videos: Life in the Balance, Strange Days on Planet Earth-invasive species, National Parks CD-ROM Invasive Species, "Endangered Species, Don't Say Goodbye", "Glaciers" on Views of the National Parks CD-ROM, An Inconvenient Truth, Wildlife and Wetlands Video
- Endangered Species Model
- Island Biogeography Activity—students use beans to determine which islands would receive the most biodiversity.
- Debate over aspects of Climate change

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will reason effectively, solve problems, and make judgements when determining factors that cause long term affects related to the health of an ecosystem.

Industry Standards and Competencies

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

NRS.01.03.02.a. Research and summarize how climate factors influence natural resources systems.
NRS.01.03.02.b. Analyze the impact that climate has on natural resources and debate how this impact has changed due to human activity.
NRS.01.03.02.c. Assess the primary causes of climate change and design strategies to lessen its impact on natural resources systems.
ESS.03. Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.
ESS.03.01.02.a. Analyze how meteorological conditions influence air quality.
ESS.03.01.04.a. Examine and summarize factors that affect the earth's balance of energy.
ESS.03.01.03.a. Research climate change and summarize evidence that climate change is occurring.
ESS.03.01.02.b. Analyze and articulate the relationship between meteorological conditions, air quality and air pollutants.
ESS.03.01.03.c. Evaluate the predicted impacts of global climate change on environmental service systems.
ESS.03.03.03.a. Examine and summarize how chemistry affects air quality and function (e.g., heat retention, formation of smog and acid rain, etc.).

Aligned Washington State Standards

Environmental and Sustainability Standards

ESE Standard 1: Ecological, Social, and Economic Systems. Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.

ESE Standard 2: The Natural and Built Environment: Students engage in inquiry and systems thinking and use information gained through experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.
ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability

Washington Science Standards (Next Generation Science Standards):
HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
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-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems
HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Unit 8: Supervised Agricultural Experience	Total Learning Hours for Unit: 5

Unit Summary
The unit will include instruction in the types of Supervised Agricultural Experience (SAE)

- Explain the history of SAE.
- Explain the benefits of SAE projects to skill development, leadership and career success.
- Explain the connection between SAE and FFA.
- Explain the five types of SAE. (Entrepreneurship, Placement, Research, Exploratory, Improvement)
- Explore ideas for SAE projects.
- Explain how SAE projects support academic achievement.
- Select and establish an SAE project.
- Explain and keep records on established SAE projects.
- Explain SAE project Supervision, visitation and assessment.
- Explain how SAE projects benefit the community.
- Seek recognition for SAE project accomplishments.
- Explain the three circle concept for SAE, FFA Leadership, and Classroom/Laboratory in an Agriculture Education program.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Select and complete a Supervised Agricultural Experience Project in the area of Entrepreneurship, Placement, Research, Exploratory or Improvement.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.

Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will work independently, produce results, and communicate clearly through the selection, implementation, and presentation of their SAE project.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards -
CRP.01. Act as a responsible and contributing citizen and employee.
CRP.01.01. Model personal responsibility in the workplace and community.
CRP.02. Apply appropriate academic and technical skills.
CRP.04. Communicate clearly, effectively and with reason.

Aligned Washington State Standards

Environmental and Sustainability Standards
ESE Standard 1: Ecological, Social, and Economic Systems. Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.
ESE Standard 2: The Natural and Built Environment: Students engage in inquiry and systems thinking and use information gained through experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.
ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability

21st Century Skills

Check those that students will demonstrate in this course:

LEARNING & INNOVATION

Creativity and Innovation
☒Think Creatively
☐Work Creatively with Others
☒Implement Innovations

Critical Thinking and Problem Solving
☒Reason Effectively
☒Use Systems Thinking
☒Make Judgments and Decisions
☒Solve Problems

Communication and Collaboration
☒Communicate Clearly
☒Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS

Information Literacy
☒Access and /evaluate Information
☒Use and Manage Information

Media Literacy
☐Analyze Media
☐Create Media Products

Information, Communications and Technology (ICT Literacy)
☒Apply Technology Effectively

LIFE & CAREER SKILLS

Flexibility and Adaptability
☐Adapt to Change
☐Be Flexible

Initiative and Self-Direction
☒Manage Goals and Time
☒Work Independently
☒Be Self-Directed Learners

Social and Cross-Cultural
☒Interact Effectively with Others
☒Work Effectively in Diverse Teams

Productivity and Accountability
☐Manage Projects
☒Produce Results

Leadership and Responsibility
☒Guide and Lead Others
☐Be Responsible to Others

Statewide Framework Document for: 030104

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 life science or 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.

Environmental Science

Course Title: Environmental Science		**Total Framework Hours: 180**
CIP Code: 030104	☒ **Exploratory** ☐ **Preparatory**	**Date Last Modified: April 25, 2016**
Career Cluster: Agriculture, Food, and Natural Resources		**Cluster Pathway: Environmental Service System**
Eligible for Equivalent Credit in: ☐ **Math** ☒ **Science**		**Total Number of Units: 5**

Course Overview

Summary:
A course that focuses on the application of biological, chemical, and physical principles to the study of the physical environment and the solution of environmental problems, including subjects such as abating or controlling environmental pollution and degradation; the interaction between human society and the natural environment; alternative energy, and natural resources management. Includes instruction in biology, chemistry, physics, geosciences, climatology, statistics, and mathematical modeling.

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).

Unit 1: Environmental Science – Bias and Data	Total Learning Hours for Unit: 35

Unit Summary:

This unit will focus on Environmental Science Issues, Bias, and Data Basics

1.1 Solving environmental problems requires research, planning, and communication skills.
1.2 Issues, Problems, and facts have different characteristics.
1.3 Environmental issues include economic, political, and ethical viewpoints
1.4 Environmental problems occur locally, nationally, and globally
1.5 Personal and media bias can be identified and analyzed
1.6 Personal and media biases impact how humans perceive and respond to environmental issues
1.7 Effective communications and conflict resolution and foster a working relationship when differing viewpoints exist
1.8 Quantitative and qualitative measurements are used in research
1.9 Uncertainty in measurement results in certain and uncertain digits
1.10 Accurate and precise measurements are required to collect reliable data
1.11 Research calculations require the use of significant figures
1.12 The properties of a data set can be analyzed using mean, mode, median, and range.

Performance Assessments:

Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

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Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will demonstrate the ability to access and evaluate information, use and manage information, and make judgements and decisions related to facts and perceptions of environmental issues.
Students will work creatively with others, work effectively in diverse teams, and collaborate with others while researching, evaluating, and communicating personal bias related to environmental science issues.

Industry Standards and Competencies

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

ESS.01.02. Properly utilize scientific instruments in environmental monitoring situations (e.g., laboratory equipment, environmental monitoring instruments, etc.).
ESS.01. Use analytical procedures and instruments to manage environmental service systems.
ESS.01.02.01.b. Demonstrate the proper use and maintenance of basic laboratory equipment.
ESS.02. Evaluate the impact of public policies and regulations on environmental service system operations.
ESS.02.02. Compare and contrast the impact of current trends on regulation of environmental service systems (e.g., climate change, population growth, international trade, etc.).
ESS.02.03. Examine and summarize the impact of public perceptions and social movements on the regulation of environmental service systems.

ESS.02.03.02.a. Examine how social views and movements (e.g., zero-waste philosophy, carbon footprints, recycling, etc.) have affected the implementation and need for regulation of environmental service systems.
ESS.02.03.01.b. Analyze and summarize specific changes to perceptions and regulations of environmental service systems and their impact on reducing the ecological, economical and sociological impact.

Aligned Washington State Standards

Environmental and Sustainability Standards
ESE Standard 1: Ecological, Social, and Economic Systems. Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.
ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability.
ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability.

Washington Science Standards (Next Generation Science Standards):
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-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
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 trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Engaging in Argument from Evidence	LS4.D Biodiversity and Humans	Cause and Effect
Obtaining, Evaluating, and Communicating Information	ETS1.B Developing Possible Solutions	
Analyzing and Interpreting Data		
Constructing Explanations and Designing Solutions		

Unit 2: Biodiversity — Total Learning Hours for Unit: 40

Unit Summary:
This unit will include instruction on investigating and exploring biodiversity

2.1 A variety of methods are used to measure biodiversity

2.2 Biodiversity is affected by the addition or extinction of species
2.3 Natural and anthropogenic events influence biodiversity
2.4 Loss of biodiversity reduces the functionality of an ecosystem.
2.5 Change in biodiversity in one ecosystem can impact the biodiversity in another ecosystem.
2.6 Ecosystem management practices can maintain biodiversity and ecosystem function

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

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Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

The students will reason effectively, use systems thinking, and work independently to analyze ecosystem management practices related to the function and interactions of ecosystems.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards -
ESS.03.05. Apply ecology principles to environmental service systems.
ESS.03.05.01.a. Research the role that biodiversity plays in environmental service systems and how biodiversity can be measured.
ESS.03.05.02.a. Examine and explain the role played by habitats on environmental service systems.
ESS.03.05.03.a. Research and explain how carrying capacities relate to environmental service systems (e.g., waste processing, rate or production of pollution, disease, etc.).
ESS.03.05.01.c. Evaluate the biodiversity of an area and predict the impact of changing the levels of biodiversity on environmental service systems.
ESS.03.05.01.b. Calculate the amount of biodiversity in a given area using an appropriate method (e.g., quadrat assessment, transect measurements, etc.).
SS.03.05.02.b. Assess the impact of the current rate of habitat loss on environmental service systems.
ESS.03.05.03.b. Assess and describe the impact of a population exceeding its carrying capacity on environmental service systems.
ESS.03.05.01.c. Evaluate the biodiversity of an area and predict the impact of changing the levels of biodiversity on environmental service systems.
ESS.03.05.03.c. Devise a strategy for monitoring and supporting environmental service systems through management of a species carrying capacity.
ESS.03.05.04.a. Examine and describe how ecological interactions can be used to assess environmental service systems (i.e., macroinvertebrates and/or amphibians as bioindicators).

Aligned Washington State Standards

Environmental and Sustainability Standards
ESE Standard 1: Ecological, Social, and Economic Systems. Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.
ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability.
ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability.

Washington Science Standards (Next Generation Science Standards):

HS-LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-4: Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
HS-LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
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-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
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 trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Analyzing and Interpreting Data	LS4.D Biodiversity and Humans	Cause and Effect
Constructing Explanations and Designing Solutions	ETS1.B Developing Possible Solutions	Patterns
Engaging in Argument from Evidence	LS2.A Interdependent Relationships in Ecosystems	
Obtaining, Evaluating, and Communicating Information	LS2.C Ecosystem Dynamics, Functioning, and Resilience	

Unit 3: Energy, Economics, and Society	Total Learning Hours for Unit: 50

Unit Summary:
This unit will include instruction on producing energy, agricultural resource issues, energy, economics, and society

3.1 Resource depletion and technology drive the development of new energy sources.
3.2 Cost impacts energy resource development.
3.3 Pollutants are released during energy source development, production, and use
3.4 Energy sources are compared using full cost accounting.
3.5 Human population growth demands the increased production of food, fuel, and fiber
3.6 Innovative agricultural practices are needed to increase the production of food, fuel, and fiber.
3.7 Agricultural practices influence biodiversity.
3.8 Genetic modification can influence biodiversity
3.9 Government energy policies and subsidies impact energy cost and development
3.10 Culture and economic status affect energy choices

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will think creatively, implement innovations, and communicate clearly while researching agricultural practices influence on biodiversity, and form their own opinions related to current laws and regulations related to environmental science issues.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards -
ESS.02. Evaluate the impact of public policies and regulations on environmental service system operations.
ESS.02.01. Interpret and evaluate the impact of laws, agencies, policies and practices affecting environmental service systems.
ESS.02.01.02.b. Analyze the specific purpose of government agencies associated with environmental service systems.
ESS.02.01.02.c. Evaluate the impact and effectiveness of government agencies (i.e., local, state, and federal) associated with environmental service systems (e.g., regulation of consumption, prevention of damage to natural resources systems, management of ecological interactions, etc.).
ESS.02.01.03.a. Research policies, practices and initiatives common in business and advocacy groups associated with environmental service systems (e.g., zero-waste, LEED-certified, locally-grown, etc.).
ESS.02.01.03.b. Assess the intent, feasibility and effectiveness of policies, practices and initiatives common in business and advocacy groups associated with environmental service systems.
ESS.02.01.03.c. Evaluate the impact of policies, practices and initiatives common in business and advocacy groups associated with environmental service systems on wildlife, people, the environment and the economy.
ESS.02.02.01.a. Research and categorize the purpose, implementation and impact of greenhouse gas emission policies (e.g., capand- trade, emission offsetting, zero-emissions, carbon-neutrality, carbon sequestration, etc.).
ESS.02.02.03.a. Examine and summarize the impact that population growth has on environmental service systems.
ESS.02.02.04.a. Research current policies related to fracking and shale oil gas.
ESS.02.02.04.b. Assess whether current policies related to fracking and shale oil gas sufficiently address the needs of environmental service systems.
ESS.02.02.02.c. Interpret and evaluate the impact of specific environmental service regulation policies (e.g., Clean Air Act, EISA, Clean Water Act, Superfund, etc.) on international trade.
ESS.03. Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology

ESS.04. Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).

Aligned Washington State Standards

Environmental and Sustainability Standards

ESE Standard 1: Ecological, Social, and Economic Systems. Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.

ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability.

ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability.

Washington Science Standards (Next Generation Science Standards):

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.

HS-PS3-3: Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*

HS-LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-4: Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

HS-LS2-6: Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS2-8: Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

HS-LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

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-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

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 trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Constructing Explanations and Designing Solutions	PS3.A: Definitions of Energy	Cause and Effect
		Energy and Matter

Unit 4: Pollution	Total Learning Hours for Unit: 30

Unit Summary:
This unit will include instruction in pollution in ecosystems, people's pollution, and pollution regulation
4.1 There are many sources of pollution in ecosystems.
4.2 Pollutants interact in ecosystems in complex ways.
4.3 Biomagnification concentrates pollutants in food chains
4.4 New technologies have changed how humans impact the environment
4.5 Pollutants affect the health of living organisms in an ecosystem.
4.6 Human population growth affects environmental pollution.
4.7 Cultures around the world contribute to and are affected by pollution in different ways
4.8 Polluted resources cause social, economic, and scientific issues
4.9 Following or abiding by government policies or regulations can reduce pollution
4.10 Environmental regulations attempt to balance the needs of the environment, individuals, businesses, and society.
4.11 Personal choices and practices can reduce pollution

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:
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Leadership Alignment:
- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will be solve problems, interact effectively with others, and communicate clearly when researching pollutants and their causes as well as ways to reduce.

Industry Standards and Competencies

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

ESS.02.03. Examine and summarize the impact of public perceptions and social movements on the regulation of environmental service systems.
ESS.03.02. Apply soil science and hydrology principles to environmental service systems.
ESS.03.02.04.a. Summarize environmental hazards associated with groundwater supplies.
ESS.03.03. Apply chemistry principles to environmental service systems.
ESS.03.03.04.a. Examine and summarize the relationship between water and soil chemistry and the formation of different kinds of wetlands (e.g., fens, peat bogs, potholes, etc.).
ESS.03.04. Apply microbiology principles to environmental service systems.
ESS.03.04.01.a. Describe the microbial biodiversity found in soil and summarize the contribution of microbial biodiversity to the physical and chemical characteristics of soil.
ESS.03.05.01.a. Research the role that biodiversity plays in environmental service systems and how biodiversity can be measured.
ESS.03.05.01.c. Evaluate the biodiversity of an area and predict the impact of changing the levels of biodiversity on environmental service systems.
ESS.03.05.03.a. Research and explain how carrying capacities relate to environmental service systems (e.g., waste processing, rate or production of pollution, disease, etc.).
ESS.03.05.04.c. Utilize evidence from bioindicator species to detect pollutants in a given area.
ESS.04.01.03.a. Interpret the conditions necessary for waste to be labeled as hazardous.
ESS.04.01.01.b. Assess how industrial and nonindustrial pollution has damaged the environment.
ESS.04.01.02.b. Conduct tests to determine the presence and extent of pollution.
ESS.04.01.03.b. Classify examples of pollution as hazardous or nonhazardous.
ESS.04.01.01.c. Evaluate evidence for a given area for industrial and nonindustrial pollution.
ESS.04.01.02.c. Create a plan for pollution remediation, management or prevention for a given area.
ESS.04. Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).
ESS.04.01. Use pollution control measures to maintain a safe facility and environment.
ESS.04.01.01.a. Identify and distinguish types of pollution and distinguish between point source and nonpoint source pollution.
ESS.04.01.02.a. Research ways in which pollution can be managed and prevented and propose solutions to meet the needs of local systems.
ESS.04.02.01.a. Compare and contrast different types of solid waste and options for treating solid waste.

Aligned Washington State Standards

Environmental and Sustainability Standards

ESE Standard 1: Ecological, Social, and Economic Systems. Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.
ESE Standard 3: Sustainability and Civic Responsibility. Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability.
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Washington Science Standards (Next Generation Science Standards):

HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
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 trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept

Unit 5: Environmental Research Project | Total Learning Hours for Unit: 25

Unit Summary

5.1 Research is driven by questions and supported by literature reviews, experimentation, and communication of results.
5.2 Background research is conducted to identify what is known about the research question.
5.3 Environmental questions are studied using research, the scientific method, critical thinking, and problem solving techniques
5.4 Results of research experiments include interpretation of data in the form of posters, papers, or oral presentations.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

-

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will create media products, be self-directed learners, and produce results when researching and creating a presentation related to their Environmental Science Research Project.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards -
ESS.04.04.02.a. Research alternative energy sources and describe the motivations for seeking alternatives to conventional energy sources as they relate to environmental monitoring.
ESS.04.04.04.a. Research the impact on environmental service systems that occur because of energy consumption.
ESS.04.04.06.a. Research and describe the purpose and applications of life cycle assessments to environmental service systems.
ESS.05.01.02.a. Research the methods in which GIS can be used in environmental service systems (e.g., tracing of point pollution, control of the spread of invasive species, etc.).
ESS.05.01.03.a. Research how advancements in technology (e.g., unmanned aerial vehicles and drones, genetic modification, fracking, alternative energy, etc.) have changed environmental service systems.
ESS.05.01.03.c. Evaluate trends in technology and develop predictions about how these advancements will change environmental service systems.
ESS.05.02. Perform assessments of environmental conditions using equipment, machinery and technology.
ESS.05.02.01.a. Research and summarize methods used to determine water quality (e.g., dissolved oxygen, chemical tests, macroinvertebrates, etc.) and determine if a source of water has been contaminated.
ESS.05.02.01.c. Evaluate a sample of water to determine its quality and if it has been contaminated.
ESS.05.02.02.a. Research and summarize methods and tools used to measure soil health and determine if an area of land has been contaminated (e.g., soil probes, core monolith, soil fertility tests, etc.).
ESS.05.02.02.c. Evaluate a sample of soil to determine its quality and if it has been contaminated.
ESS.05.02.03.a. Research and summarize methods and tools used to determine air quality and determine if pollution is present (e.g., CO2 probe, particulate matter sampler, etc.).
ESS.05.02.03.c. Perform an evaluation of air quality to determine and assess its impact of human and ecological populations.
ESS.05.02.04.a. Research and summarize methods used to determine ecological health and determine if an ecosystem is threatened (e.g., quadrat analysis, bioindicators, mark-recapture, etc.).
ESS.05.02.04.c. Evaluate a habitat to determine its ecological quality and if it is threatened.

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Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL		
Science and Engineering Practice	**Disciplinary Core Idea**	**Crosscutting Concept**

21st Century Skills		
Check those that students will demonstrate in this course:		
LEARNING & INNOVATION	**INFORMATION, MEDIA & TECHNOLOGY SKILLS**	**LIFE & CAREER SKILLS**
Creativity and Innovation ☒Think Creatively ☒Work Creatively with Others ☒Implement Innovations **Critical Thinking and Problem Solving** ☒Reason Effectively ☒**U**se Systems Thinking ☒Make Judgments and Decisions ☒Solve Problems **Communication and Collaboration** ☒Communicate Clearly ☒Collaborate with Others	**Information Literacy** ☒Access and /evaluate Information ☒Use and Manage Information **Media Literacy** ☐Analyze Media ☒Create Media Products **Information, Communications and Technology (ICT Literacy)** ☐Apply Technology Effectively	**Flexibility and Adaptability** ☐Adapt to Change ☐Be Flexible **Initiative and Self-Direction** ☐Manage Goals and Time ☒Work Independently ☒Be Self-Directed Learners **Social and Cross-Cultural** ☒Interact Effectively with Others ☒Work Effectively in Diverse Teams **Productivity and Accountability** ☐Manage Projects ☒Produce Results **Leadership and Responsibility** ☐Guide and Lead Others ☐Be Responsible to Others

Statewide Framework Document for: 120503

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 one 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.

Culinary Arts and Food Science

Course Title: Culinary Arts and Food Science		**Total Framework Hours: 1080**
CIP Code: 120503	☒ **Preparatory**	**Date Last Modified: May 4, 2015**
Career Cluster: Hospitality and Tourism		**Cluster Pathway: Restaurant and Food/Beverage Services**
Eligible for Equivalent Credit in: ☐ **Math** ☒ **Science**		**Total Number of Units: 8**

Course Overview

Summary:
The 8–10 individuals work within the hospitality industry at some point in their careers. It is one of the largest industries in the United States with many job opportunities from the farm to the table. In Culinary Arts, students learn the knowledge, skills, and practices required for careers in the hospitality industry from the food service side of the business. The course focuses on the relationship between food preparation, consumption, health, and service. Instruction includes risk management procedures, food preparation and technology in food production, diet and nutritional analysis and planning. Science is integrated throughout the course in such experiments as the caramelization of sugars and starches, the production and growth of yeast, or the effects of temperature on chocolate. Students may study such topics as the effects of antioxidants on humans, the shelf life of food products, and the positive and negative effects of bacteria on food.

During this course, students will work in teams to prepare and serve food. They will predict, interpret, and evaluate food service product and presentation for results. Throughout the course, students will discover exciting careers in the food industry. This framework is based on the American Culinary Foundations (ACF), National Family & Consumer Sciences (FACS) industry standards and is aligned with the Washington State Science Standards.

Resources for this course include:

- Principles of Food Science textbook (requested new text for 2014)
- Washington State Department of Health (www.doh.wa.gov)
- *The 12 Most Unwanted Bacteria* assignment
- *ACF standards*
- Family & Consumer Sciences National Standards
- Family Career and Community Leaders of America (FCCLA)

Unit 1 THE HOSPITALITY INDUSTRY	Hours: 40

Performance Assessment(s):

Students will analyze their work experiences and skill level by creating a career portfolio that includes, but is not limited to the following: a personal biography, resume, thank you letter, job application and cover letter.
Students will research and then compare and contrast three food service jobs in relationship to their own skills development, their plans for a food service career and the lifestyle they want to enjoy.

- Students will conduct a real or mock interview elaborating on skills, goals, and decisions made concluding with a summary of their work to date and prediction for the future.
- Students who are CTSO members (or other approved leadership) may expand this assessment to include regional and state event competitions.
- Using a variety of resources the student will research one aspect of the hospitality industry, comparing and contrasting it to others, and evaluating and analyzing the opportunities within that career path. The student will elaborate on their research by giving an original presentation (display, video production, PowerPoint presentation, etc.).

Leadership Alignment:

- Students go through an application process for student leadership, they lead other students in each station applying the 21st century skills marked below.
- Students who are CTSO members (or other approved leadership) may expand this assessment to include Regional and State event competitions.
- Students will perform job skill demonstrations and final culinary projects to the class, they will also partake in Mock interviews.

Standards and Competencies

Preparing for a successful career
1 Integrate multiple life roles and responsibilities in family, work, and community settings.
1.2 Demonstrate transferable and employability skills in community and workplaces.
2 Evaluate management practices related to the human, economic and environmental resources.
8 Integrate knowledge, skills, and practices required for careers in food production and services.
8.6.4 Examine the areas of legal liability within the food service industry.

Careers: Food service and hospitality industry opportunities
8.1.2 Explore opportunities for employment and entrepreneurial endeavors.
8.1.3 Examine education and training requirements and opportunities for career paths in food production and services.

Preparing a portfolio, resume, and application forms; completing a job interview; working on the job
1.2.2 Demonstrate job seeking and job keeping skills.
A1 Develop an understanding of the hospitality industry/career opportunities in the field.
A1.1 Define hospitality and tourism with examples of current industry philosophies.
A1.2 Trace the growth and development of the hospitality and tourism industry.
A1.3 Describe the various cuisines and the relationship to history and cultural development.
A1.4 Identify professional hospitality organizations and explain purposes and benefits to the industry. A1.5 Outline the organization, structure and functional areas in various hospitality organizations.
A1.6 Evaluate career opportunities utilizing industry resources.
A1.7 Discuss/evaluate industry trends as they relate to career opportunities and the future of the industry.
A1.8 Discuss and evaluate industry trade periodicals.

Aligned to Washington State Standards

Arts

Communication—Speaking and Listening

Health and Fitness

Language

6 - Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Vocabulary Acquisition and Use (11–12)

6 - Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Mathematics

Reading

CC: Reading Informational Text

1 - Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

CC: Reading for Literacy in Science and Technical Subjects

4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

5 - Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

Science

Social Studies

Writing

CC: Writing (11–12)

Text Types and Purposes

1 - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

- 1a - Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.
- 1c - Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- 1d - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- 1e - Provide a concluding statement or section that follows from and supports the argument presented.

2 - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

2a - Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

2b - Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

2d - Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

2e - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

2f - Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Production and Distribution of Writing

4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of language standards 1–3 up to and including grades 11–12 on page 55.)

6 - Use technology, including the internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge

7 - Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CC: Writing (9–10)

Text Types and Purposes

1 - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

1a - Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence.

1c - Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

1d - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. 1e - Provide a concluding statement or section that follows from and supports the argument presented.

2 - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

2a - Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

2b - Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

2d - Use precise language and domain-specific vocabulary to manage the complexity of the topic.

2e - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

2f - Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Production and Distribution of Writing

4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 on up to and including grades 9–10, page 55.)

6 - Use technology, including the internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Research to Build and Present Knowledge

7 - Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation
- [x] Think Creatively
- [x] Work Creatively with Others
- [ ] Implement Innovations

Creative Thinking and Problem Solving
- [ ] Reason Effectively
- [ ] Use Systems Thinking
- [x] Make Judgements and Decisions
- [ ] Solve Problems

Communication and Collaboration
- [x] Communicate Clearly
- [ ] Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy
- [x] Access and Evaluate Information
- [x] Use and Manage Information

Media Literacy
- [x] Analyze Media
- [ ] Create Media Products

Information, Communications, and Technology (ICT Literacy)
- [x] Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability
- [x] Adapt to Change
- [x] Be Flexible

Initiative and Self-Direction
- [x] Mange Goals and Time
- [x] Work Independently
- [ ] Be Self-Directed Learners

Social and Cross-Cultural
- [x] Interact Effectively with Others
- [x] Work Effectively in Diverse Teams

Productivity and Accountability
- [ ] Manage Projects
- [x] Produce Results

Leadership and Responsibility
- [x] Guide and Lead Others
- [ ] Be Responsible to Others

Unit 2 SAFETY AND SANITATION	Hours: 70

Performance Assessment(s):

- Students will acquire a state-sanctioned food handler's card (and ServSafe where taught).
- Students will demonstrate basic food safety first aid using role play situations that require assessment of the injury and appropriate treatment.
- Students will demonstrate proper food safety and sanitation practice in all food labs.
- The student will develop and use, within the day-to-day operation of the culinary kitchen, an HACCP flow chart (sanitation) that demonstrates the cause/effect relationship between food handling and serving, and understand its role to reduce/eliminate foodborne illness outbreaks.
- Students will participate in safety talks and lectures, and document safety practices in a log or journal. (HACCP, OSHA, L&I etc.)
- Students will take corrective action based on evidence gathered by instructors for continuous improvement of safety and sanitation practices. (HACCP, etc.)
- The student will pass a state-sanctioned food handler test, and demonstrate knowledge and understanding of food service safety, related vocabulary comprehension, and cause/effect relationships relative to food borne illness.
- The student will pass at 100 percent a proctored safety test, and demonstrate knowledge and understanding of safety practices in the food service facility, related vocabulary comprehension, and cause/effect relationships relative to proper use of utensils and equipment.
- All sanitation and safety procedures will be continuously applied and assessed in learning activities.
- Acting as a team leader, students will apply safety and sanitation procedures while managing purchasing and inventory systems.
- Students will 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 by comparing /contrast farming methods that impact food safety, including commercial vs. local farming, chemical pesticides vs. other methods, GMO benefits and risks.
- 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 as they develop awareness of the inspection models (random destination inspections, risk-based inspections…) used by USDA, FDA, NIH, & state agencies throughout our food chain; including the risks to public safety due to workforce/budget shortfalls.
- Students will list the effects of common Bacteria, Viruses, and Parasites. Students will demonstrate proper practices in food handling and preparation to insure public safety. Evaluating and or refining a technological solution that reduces the impacts of human activities on natural systems.

Leadership Alignment:

Student leaders organize and delegate core safety concepts in weekly safety talks, the skills applied through are the 21st century skills labeled below.

The student will demonstrate skills that assist in understanding and accepting responsibility to family, community, and business and industry. Lead Station Worker or Sanitation Supervisor Leadership Activity:

- The student will develop a safety/sanitation handbook that could be used in a food service establishment. Student develops a safety section in Culinary portfolio and documents all Sodexo Safety Talks.

Standards and Competencies

Sanitation and food safety
8.2.1 Determine pathogens found in food and their role in causing illness.
8.2.3 Use knowledge of systems for documenting, investigating, and report food borne illness.
8.2.8 Examine current types and proper uses of cleaning materials and sanitizers.
8.2.9 Use Occupational Safety and Health Administration's (OSHA) Right to Know Law and Material Safety Data Sheets (MSDS) and explain their requirements in handling hazardous materials.
8.2.8 Demonstrate waste disposal and recycling methods.
8.2.9 Demonstrate ability to maintain necessary records to document time and temperature control employee health, maintenance of equipment, and other elements of food preparation, storage, and presentation.
9.2.1 Determine factors that contribute to food borne illnesses.
9.2.7 Classify current types of cleaning materials and sanitizers and their proper use.
14.4.5 Monitor food borne illness as a health issue for individuals and families.
14.4.6 Review public dialogue about food safety and sanitation.

Establishing a food safety system
5.4.5 Determine procedures for safely handling and storing hazardous materials and waste products.
8.2.2 Employ food service management safety/sanitation program procedures.
8.2.4 Use Hazard Analysis Critical Control Point (HACCP) principles and procedures during food handling processes to minimize the risks of food borne illness.
8.2.7 Demonstrate food handling and preparation techniques that prevent cross contamination between raw and read-to-eat foods and between animal or fish sources and other food products.

Food handling/food flow
8.2.5 Practice good personal hygiene/health procedures, and report symptoms of illness.
8.2.6 Demonstrate proper receiving and storage of both raw and prepared foods.
8.2.7 Demonstrate food handling and preparation techniques that prevent cross contamination between raw and ready-to-eat foods and between animal or fish sources and other food products.
9.2.6 Demonstrate procedures for receiving and storage of raw and prepared foods

Workplace safety/regulations
1.2.7 Examine factors that contribute to maintaining safe and healthy work and community environments.
5.4.5 Determine procedures for safely handling and storing hazardous materials and waste products.
5.5.3 Demonstrate safe procedures in the use, care, and storage of equipment.
5.5.4 Apply safety and security as required by Occupational Safety and Health Administration (OSHA) and other agencies.
5.5.5 Apply procedures for infection control.
5.5.6 Examine concepts of epidemiology.
8.2.9 Use Occupational Safety and Health Administration (OSHA) Right to Know Law and Material Safety Data Sheets (MSDS) and explain their requirements in handling hazardous materials.
8.2.11 Demonstrate ability to maintain necessary records to document time and temperature control, employee health, maintenance of equipment, and other elements of food preparation, storage, and presentation.

Accident prevention
8.5.1 Demonstrate skills in knife, tool, and equipment handling.
8.6.9 Design internal/external disaster plan. First aid: safety management/emergency reporting
1.2 Demonstrate transferable and employability skills in community and workplace.
5.4.4 Record hazardous situations accurately and communicate to appropriate authorities.
5.5.2 Prepare security procedures
5.5.3 Demonstrate safe procedures in use, care, and storage or equipment.
8.2.5 Practice good personal hygiene/health procedure, and report symptoms of illness.

B1 Use/follow recognized safety and sanitation practices
B1.1 Value and demonstrate good sanitation habits.
B1.2 Identify harmful bacteria and demonstrate the proper storage of potentially hazardous foods.
B1.3 identify the hazardous areas in the kitchen and take corrective measures to ensure safe operation.
B1.4 Demonstrate proper safety method used for typical/standard culinary equipment.
B1.5 Demonstrate how to correctly wash dishes.
B1.6 Demonstrate proper equipment cleaning procedures.
B1.7 Identify and use MSDS (material safety data sheets).
B1.8 Recognize sanitary and safety design and construction features of food production equipment and facilities (i.e. NSF, UL, OSHA, ADA, etc.)
B1.9 Identify proper waste disposal methods and recycling.
B2 Demonstrate proper food quality - receiving and storage
B2.1 Arrange food product using “first in/first out” rotation system.
B2.2 Understand and identify the different food groups.
B2.3 Explain the basic nutritional values of foods.
B2.4 Identify the different pack sizes of food service products.
B2.5 Demonstrate proper storage.
B2.6 Demonstrate and use all of the principles of fresh and frozen food storage.
B2.7 Discuss the market cycle of goods into a food service operation.
B2.8 Analyze market fluctuation and the effect on product cost.
B2.9 Discuss legal and ethical considerations of purchasing.
B2.10 Describe the current computerized systems for purchasing and inventory control.
B2.11 Describe the HACCP critical control points managed by the purchasing and receiving functions.

<u>ACF Safety & Sanitation</u>
1.2. Describe good personal hygiene and health habits
1.3. List the steps to proper hand washing
1.5 Identify microorganisms which are related to food spoilage and food-borne illnesses; describe the requirements and methods for growth (FAT-TOM)
1.6 Describe symptoms common to food-borne illnesses and how these illnesses can be prevented
1.7 Describe cross contamination and use of acceptable procedures when preparing and storing PHFs
1.8 List the major reasons for, and recognize signs of food spoilage and contamination
1.12 Uses and Calibrates a Stem Thermometer, Infrared Thermometer or Thermocouple Thermometer
1.13 Identify the Critical Control Points during all food handling processes as a method for minimizing the risk of food-borne illnesses (HACCP System)
1.14 Outline the requirements for proper receiving and storage of both raw and prepared foods
1.15 Compare different types of storage areas found in a foodservice operation (refrigerated, frozen, dry goods, etc.)
1.16 Develop cleaning & sanitizing schedule, procedures for equipment & facilities, when the restaurant must close down, and the PIC
1.17 Describe use, storage and disposal of types of cleaners and sanitizers (incl. proper bleach solution)
1.18 Identify proper methods of waste disposal, composting, and recycling
1.19 Identify proper methods for safely disposing of grease and fryer oil
1.21 Uses Proper Dishwashing Process (soaking, racking, scraping, washing, checking, air drying)
1.22 Uses Proper Pots & Pans Cleaning Process (Pre-rinse, washing, rinsing, sanitizing, air dry)
1.27 Describe appropriate measures for insect, rodent and pest control
2.2 Recognize sanitary and safety design and construction features of food production equipment and facilities (i.e. NSF, US, OSHA, ADA, etc.) ACF/ NRA Safety and Sanitation
2.3 Review Material Safety Data Sheets (MSDS) and explain the requirements in handling hazardous materials
2.5 Describe appropriate types and use of fire extinguishers used in the foodservice area
2.7 Conduct a sanitation self-inspection and identify modifications necessary for compliance with standards
2.7 List common causes of typical accidents and injuries in the food service industry and outline a safety management program (spills, horseplay, improper lifting & carrying, ladder use, cuts, etc.)
2.9 Demonstrates knowledge of safety with gas appliances (pilot lights, emergency shut-offs, ventilation, etc.)
2.13 Discuss appropriate emergency policies for kitchen and dining room injuries
2.14 Describe the role of the regulatory agencies governing sanitation and safety in protecting food safety (OSHA, FDA, USDA, etc).

Aligned to Washington State Standards

Arts

Communication—Speaking and Listening

Health and Fitness

Health 2.4: Acquires skills to live safely and reduce health risks.

2.4.1 Understands types of abuse and risky situations and how to respond appropriately and safely.

3.1.2 Analyzes how environmental factors impact health.

3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.

Health 3.2: Evaluates health and fitness information.

3.2.1 Evaluates health and fitness information, products, and services.

Fitness 1.2: Acquires the knowledge and skills to safely participate in a variety of developmentally appropriate physical activities.

1.2.1 (Year One) Applies how to perform activities and tasks safely and appropriately. CBA: Concepts of Health and Fitness

1.2.1 (Year Two) Analyzes how to perform activities and tasks safely and appropriately. CBA: Concepts of Health and Fitness

1.2.4 (Year One) Analyzes safety and the importance of fitness in the work environment.

Language

2c - Spell correctly.

Vocabulary Acquisition and Use (9–10)

4c - Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology.

6 - Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readinesslevel; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression

Conventions of Standard English (11–12)

2b - Spell correctly.

Vocabulary Acquisition and Use (11–12)

4c - Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage.

6 - Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readinesslevel; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Mathematics

CC: Mathematical Practices (MP)

1 - Make sense of problems and persevere in solving them.

4 - Model with mathematics.

6- Attend to precision.

7- Look for and make use of structure.

Reading

CC: Reading for Literacy in Science and Technical

Subjects Key Ideas and Details (9–10)

1 - Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

2 - Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

Craft and Structure (9–10)

4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

5 - Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). Integration of Knowledge and Ideas (9–10)

7 - Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Reading and Level of Text Complexity (9–10)

10 - By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently Key Ideas and Details (11-12)

1 - Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

Integration of Knowledge and Ideas (11–12)

7 - Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

8 - Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Range of Reading and Level of Text Complexity (11–12)

10 - By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

C: Reading Informational Text

Key Ideas and Details (9–10)

1 - Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

2 - Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.

3 - Analyze how the author unfolds an analysis or series of ideas or events, including the order in which the points are made, how they are introduced and developed, and the connections that are drawn between them.

Craft and Structure (9–10)

1 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).

Integration of Knowledge and Ideas (9–10)

7 - Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.

Range of Reading and Level of Text Complexity (9–10)
10 - By the end of grade 9, read and comprehend literary nonfiction in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 10, read and comprehend literary nonfiction at the high end of the grades 9–10 text complexity band independently and proficiently.
Key Ideas and Details (11–12)
- Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
- Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.
- Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.
Craft and Structure (11–12)
- Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).
Integration of Knowledge and Ideas (11–12)
7 - Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
Range of Reading and Level of Text Complexity (11–12)
10 - By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11–CCR text complexity band independently and proficiently.

Science

Washington Science Standards (Next Generation Science Standards):
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.

Social Studies

Writing

CC: Writing (9–10)
Text Types and Purposes
1 - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
1a - Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence.
1c - Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
1d - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. 1e - Provide a concluding statement or section that follows from and supports the argument presented.
1 - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
2a - Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
2b - Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
3 - Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.
3e - Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.

Production and Distribution of Writing
4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 on up to and including grades 9-10 page 55.)

CC: Writing (11–12)
Text Types and Purposes
1c - Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
1d - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. 1e - Provide a concluding statement or section that follows from and supports the argument presented.
- Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
2a - Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
2b - Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
2d - Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.
- Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.
3c - Use a variety of techniques to sequence events so that they build on one another to create a coherent whole and build toward a particular tone and outcome (e.g., a sense of mystery, suspense, growth, or resolution).
Production and Distribution of Writing
- Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
- Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 11-12 on page 55.)
Research to Build and Present Knowledge
7 - Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Range of Writing
10 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

21st Century Skills		
LEARNING AND INNOVATION **Creativity and Innovation** ☐Think Creatively ☐Work Creatively with Others Implement Innovations **Creative Thinking and Problem Solving** ☐Reason EffectivelyUse ☐Systems Thinking ☐Make Judgements and Decisions Solve Problems **Communication and Collaboration** ☑ Communicate Clearly ☑ Collaborate with Others	**INFORMATION, MEDIA AND TECHNOLOGY SKILLS** **Information Literacy** ☐Access and Evaluate Information Use and Manage Information **Media Literacy** ☐Analyze Media ☐Create Media Products **Information, Communications, and Technology (ICT Literacy)** ☐Apply Technology Effectively	**LIFE AND CAREER SKILLS** **Flexibility and Adaptability** ☐Adapt to Change ☐Be Flexible **Initiative and Self-Direction** ☑ Mange Goals and Time ☑ Work Independently ☑ Be Self-Directed Learners **Social and Cross-Cultural** ☑ Interact Effectively with Others ☑ Work Effectively in Diverse Teams **Productivity and Accountability** ☑ Manage Projects ☑ Produce Results **Leadership and Responsibility** ☑ Guide and Lead Others ☑ Be Responsible to Others

Unit 3 KITCHEN BASICS	Hours: 60

Performance Assessment(s):

Performance Assessments: (Please note that there is significant overlap in the competencies and science concepts in Unit 3 and Unit 5. Both are taught simultaneously)

- Having determined the recipe yield needed, the student will convert (increase or decrease) a recipe, analyze and make recipe ingredient adjustments, and determine modifications in preparation. The student will test the recipe for conversion success.
- Students will develop and use a competency performance rubric (which includes all framework columns) for assessing the proper and efficient use of recognized standard preparation methods.
- As students work through this unit they will Construct and revise an explanation for the outcome of a simple chemical reaction based on the knowledge of the patterns of chemical properties, absorption of energy from a chemical reaction through the following assessments:
- Students will understand and demonstrate emulsifications in dressings and sauces (Students will evaluate various forms of liquid and develop a strategy to suspend multiple viscosity liquids to form an emulsion. From this evaluation students will prepare the emulsion for analysis.)
- Students will understand and demonstrate different mixing methods, especially with doughs and batters, and their impact on final product.
- (Students will apply the proper mixing method based on the dough being made. Students will prepare the product and develop a final evaluation on the overall product and if the product was mixed correctly.)
- Students will understand and demonstrate the proper use of multiple leavening agents, their reactive agents, and the properties of the final product.
- Students will explain the 4 common leavening agents Chemical, Biological, Physical, and Mechanical. Students will explain what each leavening agent is used for and what reaction each ones does and what needs to be present for reactions to happen.
- Students will understand and demonstrate the proper use of mechanical & chemical tenderizing. Students will explain the effects of acids used on proteins for marinades.
- Students will understand and demonstrate the proper use of thickening and gelling agents and discuss what products are able to be used in the gelling process. Students will compare various types of gelling agents and select the proper agent for the product being made.
- Students will 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 and demonstrate the various means of heat transfer in different cooking appliances (ovens, pans, etc.) and cooking methods.
- Students will evaluate dry heat, moist heat cooking methods, and combination methods and explain if the heat transfer is convection, conduction, microwave or radiation. Advanced will be able to discuss what percentage of a specific method is Conduction or Convection and explain their answers.
- Students will understand and demonstrate the importance of accuracy in measurement and temperature control.
- Students will understand the science of sensory perception, how we taste, etc. and how that is applied to food preparation.
- Students will understand and demonstrate the structure and development of gluten in doughs and batters.
- Students will label and explain the protein (Gluten) percentage difference in common flours found in the kitchen/bakery.
- Students will understand and demonstrate the roles of sugars, fats/oils, eggs, etc. in food preparation, especially baking.

Leadership Alignment:

Students apply to be student leaders in each station then assist in instruction of the 21st century skills marked below through skill assessments and competency work packets.

- Student demonstrates a safety, Culinary, or employability skill in front of panel.
- Mock interview will take place with industry professionals.

1.6 The student will demonstrate self-advocacy skills by achieving planned, individual goals.

Standards and Competencies

Using standardized recipes/measurements
8.5.3 Utilize weights and measures to demonstrate proper scaling and measurement techniques.
9.6.4 Create standardized recipes.
9.6.5 Manage amounts of food to meet needs of customers, clients.

Getting ready to cook: cooking methods
8.5.2 Demonstrate a variety of cooking methods including roasting and baking, broiling, smoking, grilling, sautéing, frying, deep frying, braising, stewing, poaching, steaming, working, convection, micro waving, and other emerging technologies.
8.5.4 Apply the fundamental of time and temperature to cooking, cooling, and reheating of a variety of foods.
8.5.5 Prepare various meats, seafood, and poultry.
8.5.6 Prepare various stocks, soups, and sauces.
8.5.7 Prepare various fruits, vegetables, starches, and farinaceous items.
8.5.8 Prepare various salads, dressings, marinades, and spices.
8.5.9 Prepare sandwiches, canapés, and appetizers.
8.5.10 Prepare baked goods and desserts.
8.5.11 Prepare breakfast meats, eggs, cereals, and batter products.
8.5.12 Demonstrate food presentation techniques.
8.5.13 Examine the applicability of convenience food items.
14.3.3 Demonstrate ability to select, store, prepare, and serve nutritious and aesthetically pleasing foods.

C1 Demonstrate standard recipe use
C1.1 Convert weights of measurement.
C1.2 Reduce a recipe.
C1.3 Increase a recipe.

C2 Apply recognized/standard preparation methods
C2.1 Understand and properly demonstrate the following cooking methods: roast; bake; broil; griddle, grill; sauté; braise; pan fry, deep fry; poach; simmer; boil; sear; grill- charbroil.
C2.2 Discuss the differences between dry heat and moist heat cooking methods.
C2.3 Identify the differences between convection, conduction, radiant heat, and microwave.
C2.4 Discuss the applicability of convenience, value added, further processed or par-cooked food items.

Aligned to Washington State Standards

Arts

Arts 1.0 The student understands and applies arts knowledge and skills in dance, music, theatre, and visual arts.
1.2 Develops arts skills and techniques.

Arts 2.0 The student demonstrates thinking skills using artistic processes.
Implements choices of arts elements, principles, foundations, skills, and techniques in a creative work.
2.3 Applies a responding process to an arts performance and/or presentation of dance, music, theatre and visual arts):
Engages the senses actively and purposefully in perceiving the work.
Describes what is seen, felt and/or heard (perceived/experienced).

Communication—Speaking and Listening

Health and Fitness

Language

Vocabulary Acquisition and Use (9-10)
4a - Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.
4c - Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology.
6 - Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression
2b - Spell correctly.
4c - Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage.
6 - Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Mathematics

CC: Number and Quantity (N)
2 - Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Quantities (N-Q)
1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.*
7 (+) - Solve quadratic equations with real coefficients that have complex solutions.
9 (+) - Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

CC: Mathematical Practices (MP)
1 - Make sense of problems and persevere in solving them.
2 - Reason abstractly and quantitatively.
5 - Use appropriate tools strategically.
6 - Attend to precision.

CC: Reading Informational Text Key Ideas and Details (9–10)

1 - Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

2 - Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.

Craft and Structure (9–10)

4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).

Integration of Knowledge and Ideas (9–10)

7 - Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.

Range of Reading and Level of Text Complexity (9–10)

10 - By the end of grade 9, read and comprehend literary nonfiction in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 10, read and comprehend literary nonfiction at the high end of the grades 9–10 text complexity band independently and proficiently.

Key Ideas and Details (11–12)

1 - Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

Craft and Structure (11–12)

4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).

Integration of Knowledge and Ideas (11–12)

7 - Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

Range of Reading and Level of Text Complexity (11–12)

10 - By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11–CCR text complexity band independently and proficiently.

CC: Reading for Literacy in Science and Technical Subjects Key Ideas and Details (9–10)

1 - Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

2 - Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

Craft and Structure (9–10)

4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Integration of Knowledge and Ideas (9–10)

7 - Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Key Ideas and Details (11–12)

3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure (11–12)

4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

5 - Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

6 - Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Range of Reading and Level of Text Complexity (11–12)

10 - By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

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-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
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.
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.

Social Studies

Writing

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (9–10)
1d - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
2d - Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
2e - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
6 - Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
8 - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
Range of Writing
10 - Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11–12)
1d - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
2d - Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
6 - Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
8 - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
9 - Draw evidence from informational texts to support analysis, reflection, and research. Range of Writing
10 - Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation
- [x] Think Creatively
- [x] Work Creatively with Others
- [x] Implement Innovations

Creative Thinking and Problem Solving
- [x] Reason Effectively
- [x] Use Systems Thinking
- [x] Make Judgements and Decisions
- [x] Solve Problems

Communication and Collaboration
- [x] Communicate Clearly
- [x] Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy
- [x] Access and Evaluate Information
- [x] Use and Manage Information

Media Literacy
- [x] Analyze Media
- [ ] Create Media Products

Information, Communications, and Technology (ICT Literacy)
- [x] Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability
- [x] Adapt to Change
- [x] Be Flexible

Initiative and Self-Direction
- [x] Mange Goals and Time
- [x] Work Independently
- [x] Be Self-Directed Learners

Social and Cross-Cultural
- [x] Interact Effectively with Others
- [x] Work Effectively in Diverse Teams

Productivity and Accountability
- [x] Manage Projects
- [x] Produce Results

Leadership and Responsibility
- [x] Guide and Lead Others
- [x] Be Responsible to Others

Unit 4 FOOD SERVICE EQUIPMENT	Hours: 20

Performance Assessment(s):

Performance Assessments:

- Students will use applied thinking skills to demonstrate and teach classmates the proper use of a selected piece of equipment.
- Students will apply decision-making and planning skills to demonstrate proper use of equipment, this must include demonstration and explanation, variety of uses, all safety issues, including the heat transfer with different types of pans (stainless steel, copper, aluminum…) and different cooking methods (such as use of a double boiler). Related math and science principles must be clear to the targeted audience.
- Students will communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials by explaining what a BTU is and how it relates to the heat transfer process.
- Students will 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 in an induction burner and how magnets play a key role. Students will demonstrate cooking on an induction burner.
- Students will explain the scientific manner how immersion circulation works and explain why the absences of oxygen is so important.
- Students will perform regular inspections of hot and cold holding equipment, comparing gauge temperatures to actual food temperatures, looking for signs of equipment malfunction or failure.
- Students will develop and use a competency performance rubric for assessing the proper and efficient use of equipment, hand tools, and utensils. Students will perform at a level 3 or better when assessed using the rubric, demonstrating persistence to reach these goals.
- Given a food service situation students will demonstrate correct use of appropriate equipment. Applying 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.

Leadership Alignment:

Students review and train each other on food service equipment using the 21st Century Skills marked below.

Standards and Competencies

Cooking, holding and service equipment
8.3.5 Demonstrate procedures for storage or equipment and tools. Cleaning and care of equipment
8.2.2 Employ food service management safety/sanitation program procedures.
8.2.8 Examine current types and proper uses of cleaning materials and sanitizers.
8.3.3 Maintain tools and equipment following safety procedures and OSHA requirements. D1 Practice correct use and care of hand tools, utensils, and measurement
D1.1 Identify and use the following equipment: pots and pans, processing equipment, cooking equipment, measuring equipment, hand tools, and refrigeration equipment.
D1.2 Use proper measurement.
D1.3 out a recipe and a menu; appreciate the cost of food and the profit made.
D1.4 Understand apply and value the purpose of portion control.
D1.5 Convert units of measure by increasing and decreasing recipes.
D2 Practice correct use and care of equipment D2.1 Operate all kitchen equipment safely.
D2.2 Understand the need and method of properly cleaning all kitchen equipment.

Aligned to Washington State Standards

Arts

Communication—Speaking and Listening

Comprehension and Collaboration (9-10)
1 - Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
1c - Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
6 - Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9-10 Language standards 1 and 3 on pages 54 for specific expectations.)
Comprehension and Collaboration (11-12)
1 - Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
1c - Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

Health and Fitness

Health 3.1: Understands how family, culture, and environmental factors affect personal health.
3.1.2 Analyzes how environmental factors impact health.
3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.

Language

Mathematics

Reading

CC: Reading Informational Text Craft and Structure (9–10)
4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).
Integration of Knowledge and Ideas (9-10) Key Ideas and Details (11–12)
Craft and Structure (11–12)
4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).
Integration of Knowledge and Ideas (11–12)
Range of Reading and Level of Text Complexity (11–12)
10 - By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11–CCR text complexity band independently and proficiently.

<u>CC: Reading for Literacy in Science and Technical Subjects</u> <u>Key Ideas and Details (9–10)</u>
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.
<u>Craft and Structure (9–10)</u>
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
<u>Range of Reading and Level of Text Complexity (9–10)</u>
10 - By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
<u>Craft and Structure (11–12)</u>
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

Science

Washington Science Standards (Next Generation Science Standards): Many of the standards taught in unit 3 are reinforced here through further application.
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-PS2-6 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
HS-PS4-1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
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.

Social Studies

Writing
CC: Writing (9–10) Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.) 5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 on up to and including grades 9-10 page 55.) 6 - Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. Range of Writing 10 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. CC: Writing (11–12) Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above). 5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 11-12 on page 55). 6 - Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. Range of Writing 10 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (11–12) 2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. 2a - Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. 2b - Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. 2d - Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. 5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. 6 - Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. Range of Writing 10 - Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

21st Century Skills		
LEARNING AND INNOVATION	**INFORMATION, MEDIA AND TECHNOLOGY SKILLS**	**LIFE AND CAREER SKILLS**
Creativity and Innovation ☐Think Creatively ☐Work Creatively with Others Implement Innovations **Creative Thinking and Problem Solving** ☐Reason Effectively ☐Use Systems Thinking ☐Make Judgments and Decisions ☐Solve Problems **Communication and Collaboration** ☐Communicate Clearly ☐Collaborate with Others	**Information Literacy** ☒Access and Evaluate Information ☒Use and Manage Information **Media Literacy** ☐Analyze Media ☒Create Media Products **Information, Communications, and Technology (ICT Literacy)** ☐Apply Technology Effectively	**Flexibility and Adaptability** ☒Adapt to Change Be ☒Flexible **Initiative and Self-Direction** ☒Mange Goals and Time Work Independently ☒Be Self-Directed Learners **Social and Cross-Cultural** ☒Interact Effectively with OthersWork ☒Effectively in Diverse Teams **Productivity and Accountability** ☒Manage Projects ☒Produce Results **Leadership and Responsibility** ☒Guide and Lead OthersBe ☒Responsible to Others

Unit 5 FOOD PRODUCTION TECHNIQUES	Hours: 200

Performance Assessment(s):

Performance Assessments:

- Students will perform food preparation techniques at a level 3 or better in each food preparation category listed below according to a recognized competency standard.
- The 3-D application of science learning will be practiced and assessed throughout each unit applying the applicable scientific cross cutting concepts, standards and engineering practices in the appropriate units as they are required in food preparation techniques to achieve the best results.
- Students will set goals to carry out and incorporate into their final portfolio, a meal planning and preparation extended learning project. The project shall include such steps/elements as planning, purchasing, preparation, documentation, cost analysis, and evaluation. A minimum of three courses is required, e.g., appetizer, entrée, starch, cooked vegetable, dessert. Alternately, students will compete in a culinary competition or ACF-style practical certification to demonstrate a culmination of learning.
- Students will develop and use a competency performance rubric (in each food preparation category) for assessing the application of recognized standard preparation procedures.
- Students will perform at a level 3 or better when assessed using the rubric, demonstrating persistence to reach these goals.

Leadership Alignment:

Students apply for leadership positions in the kitchen stations and apply the learning through the 21st century skills marked below.

Standards and Competencies

Dairy products and eggs: breakfast foods

8.5.11 Prepare breakfast meats, eggs, cereals, and batter products.

8.5.12 Demonstrate food presentation techniques.

9.6.3 Verify standards for food quality.

9.6.7 Implement procedures that provide cost effective products.

Sandwiches

8.5.9 Prepare sandwiches, canapés, and appetizers.

Salads and garnishes

8.5.8 Prepare various salads, dressings, marinades, and spices.

8.5.12 Demonstrate food presentation techniques.

Fruits and vegetables

8.5.7 Prepare various fruits, vegetables, starches, and farinaceous items.

E1 Apply recognized/standard procedures for breakfast cookery

E1.1 Define the features unique to the breakfast meal.

E1.2 Know and demonstrate the various methods for cooking eggs.

E1.3 Identify and prepare the various breakfast meats.

E1.4 Prepare and evaluate pancakes and potato dishes.

E2 Apply recognized/standard procedures for sandwich, hors d'oeuvres, and garnish preparation

E2.1 Describe hot and cold sandwiches.

E2.2 Describe the types of hors d'oeuvres, canapés, appetizers and fancy sandwiches.

E2.3 Demonstrate the various design and form for garnishes.

E3 Apply recognized/standard procedures for salad, fruit and salad dressing preparation

E3.1 Identify, describe and prepare various types of salads.

E3.2 Prepare and store salad greens.

E3.3 Properly handle and store fruits.

E3.4 Demonstrate methods for serving salads.

E3.5 Make the basic salad dressings.

E4 Apply recognized/standard procedures for vegetable, pasta and rice preparation

E4.1 Identify varieties of vegetables, pasta and rice.

E4.2 Know and demonstrate various cuts for vegetables.

E4.3 Understand and demonstrate the methods for cooking vegetables.

E4.4 Understand and demonstrate the methods for cooking rice.

E4.5 Understand and demonstrate the methods used for cooking pasta.

E5 Apply/integrate seasoning use in food preparation

E5.1 Recognize and use most common herbs and spices.

E6 Apply recognized/standard procedures for stock, soup and sauce preparation

E6.1 Name the different classifications of soups.

E6.2 Prepare and analyze different types of stock.

E6.3 Analyze and identify the classification of a sauce.

E6.4 Prepare and evaluate various cream soups and sauces.

E6.5 Prepare and evaluate gravies.

E6.6 Prepare and evaluate clear soups.

E6.7 Prepare and evaluate cream soup.

E6.8 Prepare and evaluate chowder.

E7 Apply recognized/standard procedures for meat cookery

E7.1 Know and apply terms used for meat identification and production.

E7.2 Understand and use the following methods for preparing meats: roast, broil, grill, sauté, braise, poach, boil, sear.

E7.3 Understand the factors that affect meat-cooking time.

E7.4 Describe the procedures for meat cookery.

E7.5 Know how to check for degree of doneness.

E7.6 Know and demonstrate carving techniques.

E8 Apply recognized/standard procedures for poultry and fish cookery

E8.1 Identify types of poultry.

E8.2 Understand and employ proper storing methods for poultry and fish.

E8.3 Know the classification of fish.

E8.4 Understand and use the common methods for cooking fish.

E8.5 Know how to cut up whole chicken.

E8.6 Understand and use the common methods of cooking chicken.

E8.7 Know how to check for degree of doneness.

E8.8 Know how to check for freshness.

E9 Apply fundamentals of baking science

E9.1 Define baking terms.

E9.2 Identify ingredients used in baking; describe properties and list function of various ingredients.

E10 Apply recognized/standard procedures for quick bread preparation

E10.1 Name the common types of quick breads.

E10.2 Prepare and evaluate breads and rolls.

E11 Apply recognized/standard procedures for yeast products preparation

E11.1 Name the common types of yeast breads.

E11.2 Participate in the production of crusty, soft, and specialty yeast products.

E11.3 Understand and employ the steps for using yeast.

E12 Apply recognized/standard procedures for dessert preparation

E12.1 Describe the types of cakes.

E12.2 Prepare and evaluate cakes.

E12.3 Know and demonstrate the common types of icings.

E12.4 Know the common types of cookies.

E12.5 Prepare and evaluate cookies.

E12.6 Know how to prepare pie shells.

E12.7 Name the common types of pie fillings.

E12.8 Prepare and evaluate pie shells, fillings, and toppings.

E12.9 Prepare and evaluate puff pastry, turnovers and choux past products.

E12.10 Prepare creams, custards, puddings and related sauces.

E13 Apply recognized/standard procedures for beverage preparation

E13.1 Prepare and evaluate coffee, tea, and cocoa beverages.

Aligned to Washington State Standards

Arts

Arts 1.0 The student understands and applies arts knowledge and skills in dance, music, theatre, and visual arts.

1.1 Understands and applies arts concepts and vocabulary.

1.2 Develops arts skills and techniques.

1.3 Understands and applies arts genres and styles from various artists, cultures, and times.

1.4 Understands and applies audience conventions in a variety of arts settings and performances.

Arts 2.0 The student demonstrates thinking skills using artistic processes.

2.1 Applies a creative process to the arts (dance, music, theatre and visual arts):

- Identifies audience and purpose.
- Explores, gathers, and interprets information from diverse sources.
- Reflects for the purpose of self-evaluation and improvement of the creative work.
- Refines work based on feedback, self-reflection, and aesthetic criteria.
- Selects artistic resources, materials and/or repertoire to create, perform and present.
- Analyzes the structure, context and/or aesthetics of the work.
- Presents, exhibits, and produces work and/or performance for others.
- Reflects and self-evaluates work and/or performance to set goals.
- Engages the senses actively and purposefully in perceiving the work.
- Describes what is seen, felt and/or heard (perceived/experienced).
- Interprets meaning based on personal experiences and knowledge.

Arts 3.0 The student communicates through the arts.

3.1 Uses the arts to express feelings and present ideas.

Arts 4.0 The student makes connections within and across the arts to other disciplines, life, cultures and work.

4.4 Understands how the arts influence and reflect culture/civilization, place and time.

4.5 Understands how arts knowledge and skills are used in the world of work including careers in the arts.

Communication—Speaking and Listening

Comprehension and Collaboration (9–10)

1 - Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

1a - Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

2 - Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

4 - Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

5 - Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

6 - Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9–10 Language standards 1 and 3 on pages 54 for specific expectations.)

Comprehension and Collaboration (11–12)

1 - Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

1a - Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

1b - Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

4 - Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range or formal and informal tasks.

5 - Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

6 - Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11–12 Language standards 1 and 3 on page 54 for specific expectations.)

Health and Fitness

Health 2.4 Acquires skills to live safely and reduce health risks.

2.4.1 Understands types of abuse and risky situations and how to respond appropriately and safely.

2.4.2 Evaluates emergency situations, ways to prevent injuries, and demonstrates skills to respond appropriately and safely.

Health 3.1 Understands how family, culture, and environmental factors affect personal health.

3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.

Language

Mathematics

CC: Mathematical Practices (MP)

1 - Make sense of problems and persevere in solving them.

2 - Reason abstractly and quantitatively.

4 - Model with mathematics.

5 - Use appropriate tools strategically.

6 - Attend to precision.

7 - Look for and make use of structure.

8 - Look for and express regularity in repeated reasoning.

CC: Number and Quantity (N)

Quantities (N-Q)

1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.*

Reading

CC: Reading Informational Text

Key Ideas and Details (9–10)

1 - Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

2 - Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.

Craft and Structure (9–10)

4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).

Integration of Knowledge and Ideas (9–10)

8 - Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.

Range of Reading and Level of Text Complexity (9–10)

10 - By the end of grade 9, read and comprehend literary nonfiction in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 10, read and comprehend literary nonfiction at the high end of the grades 9–10 text complexity band independently and proficiently.

Key Ideas and Details (11–12)

1 - Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

Craft and Structure (11–12)

4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).

Integration of Knowledge and Ideas (11–12)

7 - Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

Range of Reading and Level of Text Complexity (11–12)

10 - By the end of grade 11, read and comprehend literary nonfiction in the grades 11– CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11– CCR text complexity band independently and proficiently.

CC: Reading for Literacy in Science and Technical Subjects Key Ideas and Details (9–10)

2 - Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

Craft and Structure (9–10)

4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

5 - Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

6 - Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Range of Reading and Level of Text Complexity (9–10)

10 - By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Key Ideas and Details (11–12)

2 - Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure (11–12)

4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

Range of Reading and Level of Text Complexity (11–12)

10 - By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Science

Washington Science Standards (Next Generation Science Standards): These science concepts were taught in Unit 3 and will be applied and assessed during the food preparation experiences as applicable.

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-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
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.
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.

Social Studies

Writing

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (9–10)

2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

2d - Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

2e - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

Production and Distribution of Writing

4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

6 - Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Research to Build and Present Knowledge

7 - Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

8 - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

9 - Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

10 - Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation
- [x] Think Creatively
- [x] Work Creatively with Others
- [x] Implement Innovations

Creative Thinking and Problem Solving
- [x] Reason Effectively
- [x] Use Systems Thinking
- [x] Make Judgements and Decisions
- [x] Solve Problems

Communication and Collaboration
- [x] Communicate Clearly
- [x] Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy
- [x] Access and Evaluate Information
- [x] Use and Manage Information

Media Literacy
- [x] Analyze Media
- [x] Create Media Products

Information, Communications, and Technology (ICT Literacy)
- [x] Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability
- [x] Adapt to Change
- [x] Be Flexible

Initiative and Self-Direction
- [x] Mange Goals and Time
- [x] Work Independently
- [x] Be Self-Directed Learners

Social and Cross-Cultural
- [x] Interact Effectively with Others
- [x] Work Effectively in Diverse Teams

Productivity and Accountability
- [x] Manage Projects
- [x] Produce Results

Leadership and Responsibility
- [x] Guide and Lead Others
- [x] Be Responsible to Others

Unit 6 RESOURCE MANAGEMENT	Hours: 30

Performance Assessment(s):

Performance Assessments:

- Students will make an industry connection and conduct an informational interview and/or job shadow.
- Using a variety of resources, and application of the science principles related to farming and sustainable foods, students will analyze, design, and develop an "aspects of industry" project which shows an understanding of using and managing resource, e.g., the student will create a "mock" restaurant, catered event, community service project, "chef special of the day," etc., with supporting documentation to summarize their work and an evaluation of the process. Using a variety of presentation skills the student will present what they learned to classmates.
- Students will analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants understanding the importance of natural resources (sufficient clean potable water, mineral-rich soil, etc.), sustainable practices, the slow foods movement, etc.

Leadership Alignment:

All students have a final project where they lead the kitchen or a station to create a project, concept, menu, catering event, or daily special through the 21st century skills marked below.

Standards and Competencies

Food cost control: cost planning, profitability analysis, sales and inventory control

8.6.1 Apply principles of purchasing and receiving in food service operations.

8.6.2 Practice inventory procedures including first in/first out concept, date markings, and specific record keeping.

8.6.3 Apply accounting principles in planning and forecasting profit and loss.

9.5.2 Utilize data in statistical analysis in making development and marketing decisions.

Labor cost factors

5.7.3 Design staff schedules.

5.7.5 Apply work measurement techniques.

8.6.8 Implement marketing plan for food service operations.

F1 Recognize and use resources

F1.1 Collect, record, organize, and analyze sales data/information.

F1.2 Base decisions on data/statistical analysis

F1.3 Write requisition for production requirements

F1.4 Use recognized/standard purchasing and receiving principles.

F1.5 Collect/analyze inventory

F1.6 Practice recognized/standard inventory procedures including first in/first out concept and date markings.

F1.7 Use specific, recognized record keeping practices.

F1.8 Use recognized/standard accounting principles in planning and forecasting profit and loss.

F1.9 Record and analyze temperature logs.

F1.10 Collect, record, and implement banquet event orders.

F1.11 Develop staff schedules.

F1.12 Apply time management techniques.

F1.13 Implement marketing plan for culinary arts retail operations.

F1.14 Understand the importance of natural resources for a sustainable population.

Aligned to Washington State Standards

Arts

Communication—Speaking and Listening

Comprehension and Collaboration (9–10)

1 - Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

1a - Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

1b - Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, and presentation of alternate views), clear goals and deadlines, and individual roles as needed.

1c - Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.

2 - Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

4 - Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

5 - Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

6 - Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9-10 Language standards 1 and 3 on pages 54 for specific expectations.)

Comprehension and Collaboration (11–12)

1 - Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

1a - Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

1b - Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

1c - Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

2 - Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Presentation of Knowledge and Ideas (11–12)

4 - Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range or formal and informal tasks.

5 - Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

- Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11–12 Language standards 1 and 3 on page 54 for specific expectations.)

Health and Fitness

Language

Mathematics

CC: Mathematical Practices (MP)

1 - Make sense of problems and persevere in solving them.

2 - Reason abstractly and quantitatively.

4 - Model with mathematics.

5 - Use appropriate tools strategically.

6 - Attend to precision.

7 - Look for and make use of structure.

8 - Look for and express regularity in repeated reasoning.

CC: Number and Quantity (N)

Quantities (N-Q)

1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.*

2 - Define appropriate quantities for the purpose of descriptive modeling.*

Reading

CC: Reading for Literacy in Science and Technical Subjects Key Ideas and Details (9–10)

1 - Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

2 - Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks attending to special cases or exceptions defined in the text.

Craft and Structure (9–10)

4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Range of Reading and Level of Text Complexity (9–10)

10 - By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Key Ideas and Details (11–12)

1 - Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

2 - Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure (11–12)

4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

10 - By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

CC: Reading Informational Text

Key Ideas and Details (9–10)

1 - Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

2 - Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.

3 - Analyze how the author unfolds an analysis or series of ideas or events, including the order in which the points are made, how they are introduced and developed, and the connections that are drawn between them.

Craft and Structure (9-10)

4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).

10 - By the end of grade 9, read and comprehend literary nonfiction in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 10, read and comprehend literary nonfiction at the high end of the grades 9–10 text complexity band independently and proficiently.

Key Ideas and Details (11-12)

1 - Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

2 - Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.

3 Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.

Craft and Structure (11-12)

4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).

Range of Reading and Level of Text Complexity (11-12)

10 - By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11–CCR text complexity band independently and proficiently.

Science

Washington Science Standards (Next Generation Science Standards):

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.

Washington Science Standards (Next Generation Science Standards):

HSESS3-1 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-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.

Social Studies

Writing

CC: Writing for Literacy in History/Social Studies, Science, and Technical Subjects (9–10)

1d - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

2d - Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

Production and Distribution of Writing

5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

6 - Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Research to Build and Present Knowledge

7 - Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

8 - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

9 - Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

10 - Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation
- ☑ Think Creatively
- ☑ Work Creatively with Others
- ☑ Implement Innovations

Creative Thinking and Problem Solving
- ☑ Reason Effectively
- ☑ Use Systems Thinking
- ☑ Make Judgements and Decisions
- ☑ Solve Problems

Communication and Collaboration
- ☑ Communicate Clearly
- ☑ Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy
- ☑ Access and Evaluate Information
- ☑ Use and Manage Information

Media Literacy
- ☑ Analyze Media
- ☑ Create Media Products

Information, Communications, and Technology (ICT Literacy)
- ☑ Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability
- ☑ Adapt to Change
- ☑ Be Flexible

Initiative and Self-Direction
- ☑ Mange Goals and Time
- ☑ Work Independently
- ☑ Be Self-Directed Learners

Social and Cross-Cultural
- ☑ Interact Effectively with Others
- ☑ Work Effectively in Diverse Teams

Productivity and Accountability
- ☑ Manage Projects
- ☑ Produce Results

Leadership and Responsibility
- ☑ Guide and Lead Others
- ☑ Be Responsible to Others

Unit 7 CUSTOMER SERVICE RELATIONS/PEOPLE SKILLS AND TEAMWORK	Hours: 60

Performance Assessment(s):

In a real or role-play situation, students will demonstrate service procedures and operations of the culinary arts field and gather evidence of customer satisfaction.Students may use FCCLA Leaders at Work in food Services program for this assessment.

Students will be assessed on use of reading, writing, and communication essential learning as they develop, implement and present their project.

Level 2:
The student will apply/use recognized service procedures and operations in the culinary arts retail operation, contrasting opinion of fact.
A competency performance rubric will be used to assess the student's proper and efficient use of dining room service procedures and operations. Students will perform at a level 3 or better when assessed using the rubric, demonstrating persistence to reach these goals.

- Teams of students will develop a menu for a specific customer group "case study" and analyze its nutritional value, using available resources such as nutritional analysis software, USDA guidelines. The menu will address learning standards as appropriate to their case study. Each team will be given a different customer group "case study." Teams will present their menus to a panel that includes industry representatives.
- As part of the culinary arts retail operation, the student will use nutritional/dietary guidelines and menu planning principles to develop menu items that provide guests and customers with food choices that meet a range of dietary needs. Proper, efficient and appropriate food handling techniques will be used in the preparation of these menu items that will show evidence of menu analysis.
- The student will apply marketing and advertising methods to develop a menu that could be used in the culinary arts retail operation.

Leadership Alignment:

Students will train and lead new students in Deli/Catering operations. They also have leadership's roles in every station where they plan and produce events that apply all the 21st century skills marked below.

Standards and Competencies

The importance of customer relations

1.2.8 Demonstrate work ethics and professionalism.
5.7.1 Demonstrate quality customer service that exceeds expectations.
13.5.1 Examine the role of service as a strategic component of performance.
13.5.2 Demonstrate quality services that exceed the expectations of customers.
13.5.3 Examine the relationship between employees and customer satisfaction.
13.5.4 Apply strategies for resolving complaints.
13.5.5 Demonstrate sensitivity to diversity and individuals with special needs.

The manager's role in customer service

13.5.6 Coordinate client inquiries and requests.
13.5.7 Design themes, time lines, budgets, agendas, and itineraries.
13.5.8 Organize locations, facilities, suppliers, and vendors for specific services.
13.5.9 Prepare for distribution of event materials.
13.5.10 Demonstrate skills related to promoting and publicizing events.
13.5.11 Manage programs and events for specific age groups or populations.
13.5.12 Promote wellness through recreation and leisure programs and events.
13.5.13 Demonstrate the roles of decision making and problem solving in reducing and managing conflict.
13.5.14 Create an environment that encourages and respects the ideas, perspectives, and contributions of all group members.
13.5.15 Demonstrate strategies to motivate and encourage group members.
13.5.16 Create strategies to utilize the strengths and limitations of team members.

13.5.17 Demonstrate techniques that develop team and community spirit.
13.5.18 Demonstrate ways to organize and delegate responsibilities.
13.5.19 Create strategies to integrate new members into the team.
13.5.20 Demonstrate processes for cooperating, compromising, and collaborating.

H1 Practice recognized dining room service procedures and operation

H1.1 Know and demonstrate responsibilities of dining room team: server, bus person/drawer cashier, host/hostess, dining room managerH1.3 Using American service set a complete restaurant cover.

H1.4 Understand and demonstrate proper sanitation of the dining room.

H1.5 Identify and perform a side work duty list.

H1.6 Evaluate and demonstrate effective suggestive selling techniques.

H1.7 Demonstrate proper seating procedures.

H1.8 Demonstrate proper American food and beverage service.

H1.9 Demonstrate proper guest check writing.

H2 Practice recognized banquet procedures and set-up

H2.1 Set up meeting room.

H2.2 Set a buffet line.

H2.3 Set up various seating plans per customer: block, theater, classroom, carousel.

Diversity/team building

1.2.1 Examine potential career choices to determine the knowledge, skills, and attitudes associated with each.

1.2.3 Apply communication skills in community and workplace settings.

1.2.4 Demonstrate teamwork skills in community and workplace settings.

1.2.5 Examine strategies to manage the impact of changing technologies in workplace settings.

1.2.6 Demonstrate leadership skills and abilities in the workplace and community.

1.2.8 Demonstrate work ethics and professionalism.

8.7.5 Demonstrate sensitivity to diversity and individuals with special needs.

Employment interview and orientation; training and evaluation

1.2 Demonstrate transferable and employability skills in community and workplace settings.

5.7.4 Conduct orientation, regular training and education, and on-the-job training/retraining.

8.6.5 Verify human resource policies including rules, regulations, laws, and hiring/compensation/overtime.

8.6.6 Apply the procedures involved in staff planning, recruiting, interviewing, selecting, and scheduling of employees.

8.6.7 Conduct staff orientation, regular training and education, and on-the-job training.

8.6.8 Implement marketing plan for food service operations.

I1 Prepare for the transition to employee and from employee to supervisor

I1.1 Demonstrate effective communication and interpersonal skills: a) interact with others using tact and courtesy in both verbal and non-verbal communication; b) set and utilize appropriate rules when interacting with others; c) use effective structure and presentation style when speaking; d) use effective listening skills; e) adapt communication skills to appropriate environment and medium.

I1.2 Demonstrate the ability to work as a group member in the production of quality work: a) knowledge of own and others' interactive styles; b) ability to relate and interact effectively in teams consisting of individuals with differing interests, genders, backgrounds and professions.

I1.3 Logically and effectively solve personal and professional problems: a) adapt to change; b) deal constructively with stress; c) conflict resolution.

I1.4 Demonstrate ability to set and work towards goals within a set time line: a) set priorities, plan time lines, take action, evaluate and adjust accordingly; b) identify professional goals; c) reflect on short-term goals to measure personal effectiveness.

I1.5 Carry out steps in job search and obtain employment: a) job interview; b) correct professional appearance and conduct; c) commit to industry work ethics.

I1.6 Identify and value quality: a) able to identify standards of quality; b) assess a service/product and determine if meets defined quality standard; c) able to define quality

process; d) willing to adjust to meet quality standards.
I1.7 Describe procedure to progressive discipline.

I1.8 Discuss technique for motivating employees.

I1.9 Outline current federal and state employment laws.
I1.10 Use proper evaluative techniques.

Aligned to Washington State Standards

Arts

Arts 2.0 The student demonstrates thinking skills using artistic processes.

2.1. Applies a creative process to the arts (dance, music, theatre and visual arts):

- Explores, gathers, and interprets information from diverse sources.
- Implements choices of arts elements, principles, foundations, skills, and techniques in a creative work.
- Refines work based on feedback, self-reflection, and aesthetic criteria.
- Presents work to others in a performance, exhibition, and/or production.
- Performs work for others in a performance and/or production.

2.2 Applies a performance and/or presentation process to the arts (dance, music, theatre and visual arts):

- Presents, exhibits, and produces work and/or performance for others.

Communication—Speaking and Listening

Comprehension and Collaboration (9–10)

1 - Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

1a - Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. Presentation of Knowledge and Ideas (9–10).

5 - Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Comprehension and Collaboration (11–12)

3 - Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

5 - Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

6 - Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11–12 Language standards 1 and 3 on page 54 for specific expectations.)

Health and Fitness

Language

Conventions of Standard English (9–10)

1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

1b - Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) and clauses (independent, dependent; noun, relative, adverbial) to convey specific meanings and add variety and interest to writing or presentations.

2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

2c - Spell correctly.

Knowledge of Language (9–10)

3 - Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Vocabulary Acquisition and Use (9–10)

4c - Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology.

6 - Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Conventions of Standard English (11–12)

2b - Spell correctly.

Vocabulary Acquisition and Use (11–12)

4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, choosing flexibly from a range of strategies.

4c - Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage.

6 - Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readinesslevel; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Mathematics

CC: Mathematical Practices (MP)

1 - Make sense of problems and persevere in solving them.

5 - Use appropriate tools strategically.

6 - Attend to precision.

8 - Look for and express regularity in repeated reasoning.

Reading

CC: Reading Informational Text

Craft and Structure (9–10)

4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).

3 - Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.

Science

Social Studies

Social Studies Skills

Social Studies Skills 5.3: Deliberates public issues.

5.3.1 (9–10) Evaluates one's own viewpoint and the viewpoints of others in the context of a discussion.

5.3.1 (11) Creates and articulates possible alternative resolutions to public issues and evaluates these resolutions using criteria that have been identified in the context of a discussion.

Social Studies Skills 5.4: Creates a product that uses social studies content to support a thesis and presents the product in an appropriate manner to a meaningful audience.

5.4.1 (11) Evaluates and interprets other points of view on an issue within a paper or presentation.

Economics

Econ 2.1: Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.

Writing

CC: Writing (11–12)

2 - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

- 2d - Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.
- 2e - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

3 - Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

- 3d - Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters.

Production and Distribution of Writing

4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation
- ☑ Think Creatively
- ☑ Work Creatively with Others
- ☑ Implement Innovations

Creative Thinking and Problem Solving
- ☑ Reason Effectively
- ☑ Use Systems Thinking
- ☑ Make Judgements and Decisions
- ☑ Solve Problems

Communication and Collaboration
- ☑ Communicate Clearly
- ☑ Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy
- ☑ Access and Evaluate Information
- ☑ Use and Manage Information

Media Literacy
- ☑ Analyze Media
- ☑ Create Media Products

Information, Communications, and Technology (ICT Literacy)
- ☑ Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability
- ☑ Adapt to Change
- ☑ Be Flexible

Initiative and Self-Direction
- ☑ Mange Goals and Time
- ☑ Work Independently
- ☑ Be Self-Directed Learners

Social and Cross-Cultural
- ☑ Interact Effectively with Others
- ☑ Work Effectively in Diverse Teams

Productivity and Accountability
- ☑ Manage Projects
- ☑ Produce Results

Leadership and Responsibility
- ☑ Guide and Lead Others
- ☑ Be Responsible to Others

Unit 8 NUTRITION AND MEAL PLANNING	Hours: 60

Performance Assessment(s):

- Teams of students will develop a menu for a specific customer group "case study" and analyze its nutritional value, using available resources such as nutritional analysis software,USDA guidelines.
- They will 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. Understanding how this process may affect a client's health.
- The menu will address learning standards as appropriate to their case study. Each team will be given a different customer group "case study." Teams will present their menus to a panel that includes industry representatives.
- As part of the culinary arts retail operation, students will 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. The student will use nutritional/dietary guidelines and menu planning principles to develop menu items that provide guests and customers with food choices that meet a range of dietary needs. Proper, efficient and appropriate food handling techniques will be used in the preparation of these menu items that will show evidence of menu analysis.
- The student will research and review a number of marketing/advertising styles and examples to develop a menu that could be used in the culinary arts retail operation.

Leadership Alignment:

The student will understand the organizational skills necessary to be a successful leader and citizen and practices those skills in real-life. As part of the instruction, students will partake in scientific nutritional experiments with station leaders to exemplify core culinary concepts and utilize 21st Century skills marked below. As part of the culinary arts retail operation, the student will produce nutritional items daily and will plan meals or events incorporating all the 21st Century skills marked below.

Standards and Competencies

Nutrition basics

9.3.2 Appraise and interpret nutritional data.

9.3.3 Assess principles to maximize nutrient retention in prepared foods.

14.2.1 Assess the effect of nutrients on health, appearance, and peak performance.

14.2.4 Appraise sources of food and nutrition information, including food labels, related to health and wellness.

Nutritional guidelines

9.3.4 Assess the influence of socioeconomic and psychological factors on food and nutrition behavior.

9.3.5 Monitor recipe/formula proportions and modifications for food production.

9.4.3 Utilize a selective menu.

9.4.4 Select appropriate special nourishment based on nutritional needs.

9.4.5 Instruct individuals on nutrition for health maintenance and disease prevention.

Focusing on the menu; making menus more nutritious

8.4.1 Use computer based menu systems.

8.4.2 Apply menu-planning principles to develop and modify menus.

8.4.3 Examine food and equipment needed for menus.

8.4.4 Do menu layout and design.

8.4.6 Record performance of menu items.

9.3.6 Critique the selection of foods to promote a healthy lifestyle.

G1 Apply principles of nutrition to menu planning and food preparation

G1.1 List the six food groups in the current USDA My Pyramid and the recommended daily servings from each; list the major nutrients contributed by each of the food groups.

G1.2 Discuss the new dietary guidelines and adapt recipes.

G1.3 Describe the characteristics, functions and sources of the major nutrients.

G1.4 List the primary functions and best sources of each of the major vitamins and minerals.
G1.5 Discuss and demonstrate cooking techniques and storage principles for maximum retention of nutrients.
G1.6 Identify common food allergies and determine appropriate substitutions.
G1.7 Discuss contemporary nutritional concerns such as vegetarianism, heart health menus and religious dietary laws.
G2 Apply principles of menu planning and layout to the development of menus for a variety of types of facilities and service
G2.1 List basic menu planning principles.
G2.2 Identify principles of menu layout and design.
G2.3 Create menu item descriptions following established truth-in-menu guidelines.
G2.4 Determine menu prices utilizing proper cost controls.
G2.5 Discuss importance of product mix, check average and their impact on profit contribution.

Aligned to Washington State Standards

Arts

Communication—Speaking and Listening

Health and Fitness

1.1.5 (Year One) Applies understanding of movement concepts.
1.1.5 (Year Two) Evaluates understanding of movement concepts.
Fitness 1.2: Acquires the knowledge and skills to safely participate in a variety of developmentally appropriate physical activities.
1.2.1 (Year One) Applies how to perform activities and tasks safely and appropriately. CBA: Concepts of Health and Fitness
1.2.1 (Year Two) Analyzes how to perform activities and tasks safely and appropriately. CBA: Concepts of Health and Fitness
Fitness 1.5: Understands relationship of nutrition and food nutrients to body composition and physical performance
1.5.1 (Year One) Analyzes the relationship of nutrition planning to physical performance and body composition
1.5.1 (Year Two) Evaluates the relationship of nutrition planning to physical performance and body composition
1.5.2 (Year One) Evaluates how nutritional requirements change.
1.5.3 (Year One) Analyzes the effectiveness of various nutritional products.
Fitness 4.2: Develops and monitors a health and fitness plan.
4.2.1 (Year One) Evaluates the concepts of a health, fitness, and nutrition plan and monitoring system, based on life and employment goals.
4.2.1 (Year Two) Creates a plan and monitoring system using health, fitness, and nutrition based on life and employment goals.
4.2.2 (Year One) Understands barriers to physical activity and a healthy lifestyle.

Health 2.1: Understands dimensions and indicators of health.
2.1.1 Evaluates dimensions of health and relates to personal health behaviors.
2.4.1 Understands types of abuse and risky situations and how to respond appropriately and safely.
Health 3.1: Understands how family, culture, and environmental factors affect personal health.
3.1.2 Analyzes how environmental factors impact health.

Language

Mathematics

CC: Mathematical Practices (MP)

1 - Make sense of problems and persevere in solving them.

6 - Attend to precision.

7 - Look for and make use of structure.

Reading

Science

Washington Science Standards (Next Generation Science Standards):

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.

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.

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

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.

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.

HS-LS2-8 Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

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-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.

Social Studies

Writing

CC: Writing (11–12)

2 - Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

2d - Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

2e - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

3c - Use a variety of techniques to sequence events so that they build on one another to create a coherent whole and build toward a particular tone and outcome (e.g., a sense of mystery, suspense, growth, or resolution).

3d - Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters.

Range of Writing

10 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation
- [x] Think Creatively
- [x] Work Creatively with Others
- [x] Implement Innovations

Creative Thinking and Problem Solving
- [x] Reason Effectively
- [x] Use Systems Thinking
- [x] Make Judgements and Decisions
- [x] Solve Problems

Communication and Collaboration
- [x] Communicate Clearly
- [x] Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy
- [x] Access and Evaluate Information
- [x] Use and Manage Information

Media Literacy
- [x] Analyze Media
- [x] Create Media Products

Information, Communications, and Technology (ICT Literacy)
- [x] Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability
- [x] Adapt to Change
- [x] Be Flexible

Initiative and Self-Direction
- [x] Mange Goals and Time
- [x] Work Independently
- [x] Be Self-Directed Learners

Social and Cross-Cultural
- [x] Interact Effectively with Others
- [x] Work Effectively in Diverse Teams

Productivity and Accountability
- [x] Manage Projects
- [x] Produce Results

Leadership and Responsibility
- [x] Guide and Lead Others
- [x] Be Responsible to Others

Statewide Framework Document for: 150613

Standards may be added to this document prior to submission, but may not be removed from the framework to meet state credit equivalency requirement. The equivalency material is either embedded organically into the curriculum or called out through worksheets, activities, projects and standard assessments. Credit equivalency options are designed for Skills Centers (540 hours) or a two year or block period high schools (360 hours). 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 3rd year Math.

Washington Mathematics Standards (Common Core State Standards) support foundational mathematical knowledge and reasoning. While it is important to develop a conceptual understanding of mathematical topics, and fluency in numeracy and procedural skills, teachers, should also focus on the application of mathematics to career fields to support the three (3) key shifts of CCSS. The Standards for Mathematical Practice develop mathematical habits of mind and are to be modeled and integrated throughout the course. Washington English Language Arts Standards

Core Template	
Course: <Generated by Individual District>	**Total Framework Hours up to: 540**
CIP Code: 150613 ☐ **Exploratory** ☒ **Preparatory**	**Date Last Modified: 04/04/2016**
Career Cluster: Manufacturing	**Cluster Pathway: Manufacturing Production Process Development**
Resources Used: Aerospace Joint Apprenticeship Committee (AJAC), American Society of Metals (ASM), Boeing, Federal Aviation Association (FAA), National STEM Consortium (NSC), Non-Destructive Resource Center (NDT), and other industry-accepted knowledge, skills and abilities (KSA).	

Unit 1: Materials Science	**Hours: 140**

Performance Assessments:

Assessments will be formal and informal, written, verbal and practical:

Lesson 1:

- Handout: Scope and Sequence for Classifying Matter
- Activity: General Comparison of Properties: Metals, Ceramics, Polymers Overhead
- Introductory Activity – Oobleck
- Activity: The Stuff of History
- Lab: A Physical Challenge Lab – Can elements be classified by physical properties?
- Lab: White Powder

- Lab: Materials ID
- Overheads/handouts: Classification of Materials
- Overheads/handouts: Types of Bonding
- Overheads/handouts: Types of Properties
- Handout: Materials ID Descriptions
- Student Booklet: Reading, Writing, and Activities

Lesson 2:

- Lab: Sulfur
- Lab: Rhombic Sulfur
- Lab: Amorphous Sulfur
- Activity 1: Copper Sulfate Demonstration (Growing single crystals)
- Activity 2: Phenyl Salicylate Demonstration
- Lab: Growing Silver Crystals
- Lab: Models of Crystals
- Activity: Iron Wire Demo
- Activity 3: Copper Wire Demonstration
- Lab: Heat – Treating Steel
- Lab: Heat Treating Iron
- Activity: Journaling
- Extra Activities: MAST Module Metals – Experiment 3 Processing Metals and Experiment 4 Tensile Strength Test for Various Metals
- Student Booklet: Reading, Writing, and Activities

Lesson 3:

- Lab: Metal Stations
    - Cost of a Penny
    - Brassing a Penny
    - Penny and Electricity (Rolling of a Penny)
- Lab: Reactivity of Metals
- Lab: Fruit Juice
- Lab: NACE Kit Labs
- Activity: Compression Ignition Demonstration
- Activity: Demonstration – Aluminum and HCI
- Activity: Aluminum Coating and Protection
- Student Booklet: Reading, Writing, and Activities

Lesson 4:

Module 1: Chemistry for Composites

Note: There are multiple activities and labs to choose from. Select which ones are appropriate for your class and where you have the equipment and supplies.

Addendum includes:

- Activity 1: Nylon Polymerization
- Activity 2: Match the Fabric to the Label

- Activity 3: Weaves
- Activity 4: Cardboard Laminate
- Lab: Honeycomb Panel
- Lab: Fiberglass Hand Layup
- Lab: Composite Panel Repair
- Lab: Foam Core Composites
- Lab: Wet Lay-Up
- Lab: Wet Lay-Up with Foam Core
- Lab: Wet Lay-Up in Mold
- Lab: Vacuum Bagging Wet Lay-Up
- Lab: Resin Infusion
- Lab: Vacuum Bagging PrePreg
- Lab: Vacuum Bagging PrePreg with Foam Core
- Lab: Vacuum Bagging PrePreg with Honeycomb
- Lab: Isotropic Panel (Clipboard), 2-Day Minimum

Module 2: Structure and Repair I

- Student Quiz

Module 3: Structure and Repair II

- Student Quiz

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects (individual and group), activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Explain the importance of materials sciences.
- Apply basic chemistry to explain physical and chemical characteristics of the four categories of materials.
- Apply knowledge of materials science to explain materials choices in design.
- Use critical thinking to evaluate and apply appropriate materials choice for specific applications.
- Demonstrate practical reasoning, and hands-on/minds-on, problem-solving skills in designing, fabricating, and constructing projects during the course.
- Use writing to record observations, procedures, and experiments and as a tool for thinking, studying, and learning the subject matter.
- Define materials science and how it has changed through history.
- Classify matter.
- Summarize the spatial relationships found on the Periodic Table of Elements.
- Define types of structure, crystalline vs. amorphous.
- Define types of bonding.
- Identify types of properties.
- Relate properties to types of bonding.
- Describe through writing and discussion the basic properties of materials: mechanical, thermal, chemical, optical, and magnetic.
- Characterize materials on the basis of chemical bonding and crystal structure.
- Distinguish between crystal structure and crystal system.
- Describe the relationship between atomic radius and lattice parameter.
- Compare and contrast crystalline and amorphous structures.

- Provide examples of materials that change among amorphous and crystalline states.
- Describe the effect of crystal defects and imperfections in material properties.
- List several common materials used in the design and construction of structures.
- Define simple properties of materials, such as strength, flexibility, transparency.
- Select suitable materials for making a particular object based on their properties.
- Explain the advantages and disadvantages of common materials used in engineering structures.
- Distinguish between chemical and physical properties of a material.
- Differentiate between oxidation and reduction especially as they pertain to galvanic corrosion.
- Define thermal expansion.
- Evaluate the effects of thermal expansion on design considerations.
- Describe the response to force or stress using the terms: workability (malleability and ductility), brittleness, hardness, elasticity and plasticity, toughness and strength.
- Define mechanical properties: tensile strength, compression, fatigue, flexure, impact, torsion, hardness, and shear.
- Relate the physical characteristics of materials such as workability and brittleness to the mechanical properties such as tensile and compressive strength to impact design considerations.
- Describe composite materials.
- Explain the use of ancillary materials.
- Demonstrate basic fabrication techniques.
- Define fiber-reinforced composites.
- Discuss properties of composites.
- Recognize products made from fiber-reinforced composites.
- Explain the differences between polymers and composites.
- Explain the key differences between composites properties and metal properties.
- Calculate resin-fiber ratio.
- Fabricate a fiber reinforced composite part.
- Demonstrate safe fabrication practices.
- Define and prevent resin migration and materials contamination.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts Informational Technology: *Writing*	
CCSS English/Language Arts Informational Technology: *Speaking & Listening*	

CCSS English/Language Arts Informational Technology: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge.
CCSS Math	
Unit Wide	MP1. Make sense of problems and preserve in solving them MP 2. Reason abstractly and quantitatively. MP 4. Model with mathematics. MP 5. Use appropriate tools strategically. MP 6. Attend to precision. MP 7. Look for and make use of structure. MP 8. Look for and express regularity in repeated reasoning. N-Q.A Reason Quantitatively and use units to solve problems. N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. G-CO.A Experiment with transformation in the plane. G-SRT.A Understand similarity in terms of similarity transformation
Health and Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

Unit 2: Shop Tools	**Hours: 20**

Performance Assessment(s):
Assessments will be formal and informal, written, verbal and practical:
Lesson 1:

- [1]Hand Tools ID Activity

Lesson 2:

- Class Discussion

Lesson 3:

- Power Shop Equipment Test

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

- Articulate tool use hazards and main causes for hand tool mishaps.
- List the workplace tasks that require hand tools to accomplish.
- Describe and select the appropriate hand tool to accomplish a particular workplace task.
- Distinguish between tools that are similar in appearance, stating the commonly used terms for each tool and normal routine application.
- Explain basic techniques and proper use of hand tools.
- Identify and use equipment and tools for manufacturing.
- Use portable power hand tools, including pistol grip drill motor, rivet gun, ratchet wrench, Microstop Countersink Cage, Lockbolt Puller, and Hi-Lok Ratchet Wrench, Nut Runner and Torque Wrench appropriately and safely.
- Interpret a drawing to lay out a job, including the placement of holes, and selection of appropriate tools and fasteners to perform the job.
- Use gages appropriately.
- Install Lockwire.
- Complete the job, per drawing specifications, in accord with the Instructor's performance criteria.
- Articulate general safety hazards associated with the operation of installed power shop equipment.
- List workplace tasks or functions that require power shop equipment to accomplish.
- Describe and select the appropriate power equipment to accomplish a particular workplace function.
- Explain the potential hazards of each individual power shop machine.
- List and point to the safety controls used for each power shop machine and items to inspect prior to use.
- Specify the features and major components of each shop machine in this Unit.
- Explain basic techniques and proper use of common power shop equipment and machinery, including the drill press, disk sander, belt sander, pedestal grinder, band saw, and the manual foot shear.

Aligned Washington State Standards

CCSS English/Language Arts: *Reading*

CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP5: Use appropriate tools strategically. MP6: Attend to precision. N-Q.Q.A: Reason quantitatively and use units to solve problems. N-Q.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

Unit 3: Safety	**Hours: 20**
COMPONENTS AND ASSESSMENTS	

Performance Assessments:
Assessments will be formal and informal, written, verbal and practical:
Lesson 1:

- [1]Math Worksheet: Interpreting Occupational Injury and Illness Data
- Test

Lesson 2:

- [1]Tombstone Project

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

- Student will be able to describe EHS programs
- Student will be able to practice HazCom
- Student will be able to practice Erognomics
- Student will be able to describe regulations
- Student will be able to model Human Factors
- Student will be able to practice SOP
- Student will be able to demonstrate and use PPE
- Student will be able to identify lockout/tagout
- Student will be able to practice hand powertool safety
- Student will be able to practice industrial housekeeping
- Student will be able to practice environmental safety
- Demonstrate safe practices, including choice of proper PPE, in the use of hand tools such as punch, files, deburring tools, shear, and brake.
- Demonstrate safe practices, including choice of proper PPE, in the use of hand held power tools such as drills.
- Demonstrate safe practices in the use of floor-mounted horizontal band saw and drill press.
- Locate, select, and interpret Material Safety Data Sheets (MSDS) for various materials called out in a project.
- Explain SOPs of the school laboratory.
- Evaluate a situation and design a safety alternative accounting for a range of constraints.
- Appropriately document the use of materials and manufacture of a project consistent with institution policy Quality Management System (QMS).

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts Informational Technology: *Writing*	
CCSS English/Language Arts Informational Technology: *Speaking & Listening*	

CCSS English/Language Arts Informational Technology: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP2: Reason abstractly and quantitatively S-IC.B Making inference and justifying conclusions S-IC.B.3 Make inferences and justify conclusions from sample surveys, experiments, and observational studies: Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
Lesson 2	MP4 Model with mathematics MP5: Use appropriate tools strategically. MP6: Attend to precision. N-Q.Q.A: Reason quantitatively and use units to solve problems. N-Q.Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. G-GMD.B Visualize relationships between two-dimensional and three-dimensional object G-GMD.B.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

Unit 4: Standard Operating Procedures	Hours: 20

COMPONENTS AND ASSESSMENTS

Performance Assessments:
Assessments will be formal and informal, written, verbal and practical:
Lesson 1:

- [1]Math Worksheet: Late to Work
- Student Booklet: Readings, Questions, Assignments and Activities

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Standard/Unit:

- Define QMS.
- Describe the "enterprise level" of QMS.
- Explain the hierarchy of a manufacturing production order.
- Identify and document a standardized process in their environment.
- Demonstrate knowledge of SOP.
- Evaluate and design revisions required for increase/effective the enterprise QMS.
- Define Root Cause Analysis in fundamental terms.

Aligned Washington State Standards

CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts Informational Technology: *Writing*	
CCSS English/Language Arts Informational Technology: *Speaking & Listening*	
CCSS English/Language Arts Informational Technology: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP2: Reason abstractly and quantitatively

	S-IC.B Making inference and justifying conclusions S-IC.B.3 Make inferences and justify conclusions from sample surveys, experiments, and observational studies: Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
Health & Fitness	
Social Studies	
Art	
Science	

Unit 5: Precision Measurement	**Hours: 20**
COMPONENTS AND ASSESSMENTS	

Performance Assessment(s):
Assessments will be formal and informal, written, verbal and practical:
Lesson 1:

- [1]Math Worksheet: Solving for Radical Solutions
- [1]Student Booklet: Semi-Precision Measurement:
  - Using a Scale
  - Reading a Scale

Lesson 2:

- [1]Student Booklet: Geometric Dimensioning & Tolerancing

Lesson 3

- [1]Worksheets 1 and 2: Reading a Micrometer
- [1]Lab Activity: Practicing Precision Measurement
- [1]Exam: Measurement covers Lessons 1, 2, and 3
- [1]Student Booklet: Precision Measurement
  - 6-Inch Dial Calipers
  - Micrometers
  - Ball Gages

Leadership Alignment: Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.
Industry Standards and Competencies
Student will be able to: • Define Semi-Precision Measurement and identify units used. • Explain the care and handling procedures of semi-precision measurement tools. • Read a 1/64th English Rule (machinist's scale). • Identify the Geometric Dimensioning and Tolerancing (GD&T) symbols that represent specific tolerances. • Read a Feature Control Frame • Define Precision Measurement and units used. • Explain care and handling procedures of Precision Measurement tools, and the need and procedure for calibration. • Identify the parts and read a caliper (Vernier and/or dial). • Identify the parts, and read an outside Micrometer.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	[1]Math Worksheet: Solving for Radical Solutions (Addendum) MP1: Make sense of problems and persevere in solving them. A-REI.B: Reasoning with Equations and Inequalities. A-REI.B.4: Solve quadratic equations in one variable.

	[1] Semi-Precision Measurement Practice: Using and Reading a Scale MP5: Use appropriate tools strategically. MP6: Attend to precision. N-Q.A: Reason quantitatively and use units to solve problems. N-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Lesson 2	MP6: Attend to precision. G-GMD.B: Visualize relationships between two-dimensional and three-dimensional objects. G-MG.A: Apply geometric concepts in modeling situations. Use geometric shapes, their measures, and their properties to describe objects.
Lesson 3	MP5: Use appropriate tools strategically. MP6: Attend to precision. N-Q.A: Reason quantitatively and use units to solve problems. N-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Health & Fitness	
Social Studies	
Art	
Science	

Unit 6: Fasteners	**Hours: 10**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical:

Lesson 1

- [1]Worksheet - Thread Measurement: Three Wire Method
- Practice Review Quiz
- [1]Nut & Bolt Installation Activity

Lesson 2

- Practice Review Quiz
- [1]Permanent Fastener Installation Activity

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Identify the components of a fastening system using nuts & bolts
- Indicate and describe the standard features of bolts and nuts
- Specify the materials from which bolts & nuts are made
- Identify protruding bolt head style
- Summarize the use of lubricants and locking devices with nuts & bolts
- Distinguish between sheer and tension as types of stress/load on installed bolts
- List the four forces acting on installed bolts
- Explain the significance of measuring KSI Tensile strength and KSI Shear Strength
- Use a Grip Scale to verify bolt length
- Measure interior diameter of a drilled hole using a hole gage and micrometer
- Demonstrate the normal installation of bolts
- Categorize torque wrench types
- Properly operate a torque wrench
- Identify the components of a fastening system using hex-drive fasteners and lockbolts.
- Indicate and describe the standard features of hex-drive fasteners and lockbolts.
- Distinguish between Hi-Lite and Hi-Lok fasteners and explain the different uses for which they may installed.
- Using a power drill motor, socket and hex drive wrench, demonstrate the normal installation of hex-drive fasteners such as Hi-Lites and Hi-Loks.
- Distinguish protruding head from flush head fasteners.
- Explain the limitations and normal use of washers when installing fasteners on aircraft.
- Summarize inspection checks done after fastener installation.
- Demonstrate the proper removal of hex drive fasteners.
- Point out features of lockbolts, explaining how they are used to securely fasten parts or sheets of material together.
- State the safety considerations when using a lockbolt puller.
- Describe or demonstrate normal procedures for installation of lockbolt fasteners.
- Distinguish lockbolt installations that are acceptable from those that are unacceptable.

Aligned Washington State Standards

CCSS English/Language Arts: Reading

CCSS English/Language Arts: *Writing*

CCSS English/Language Arts: *Speaking & Listening*

CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	[1]Worksheet - Thread Measurement: Three Wire Method MP4 Model with mathematics. MP5 Use appropriate tools strategically. F-BF.A.1.A Write a function that describes a relationship between two quantities. F-BF.A.1.B Build new functions from existing functions. [1]Nut & Bolt Installation Activity MP4 Model with mathematics MP5: Use appropriate tools strategically. MP6: Attend to precision. N-Q.B: Reason quantitatively and use units to solve problems. N-Q.B.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects.
Lesson 2	[1] Permanent Fastener Activity MP4 Model with mathematics MP5: Use appropriate tools strategically. MP6: Attend to precision. N-Q.A: Reason quantitatively and use units to solve problems. N-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	

Art	
Science	

Unit 7: Drilling	**Hours: 10**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- [1]Worksheet: Keep Batch or Not? Standard Deviation
- Practice Review Quiz

Lesson 2:

- Practice Review Quiz
- [1]Practical Drilling Activity

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Identify the characteristics of a properly drilled hole in aluminum in accordance with specifications and industry standards.
- State the importance of creating quality holes in aluminum structure.
- State the qualities of a properly drilled and accurate hole.
- Identify proper drilling equipment (Size, Type and Speed) required for drilling.
- Convert available fractional drill sizes to the required decimal equivalent drill bit needed, using the decimal equivalency card.
- Correctly select the drill guide for the drill bit being used.
- Define and explain the function to the component parts of a counter sink.
- Identify countersink cutters.
- Set a stop countersink for a specific fastener hole location.
- Identify the correct deburring / chamfering tool.
- Provide definition and function to the acceptable and preferred deburring tools.
- Define fastener relief requirements.
- Identify proper drilling equipment (Size, Type and Speed) required for drilling.
- Convert available fractional drill sizes to the required decimal equivalent drill bit needed for a task, using the decimal equivalency card to convert.

- Correctly select the appropriate drill guide for the drill bit being used.
- Set-up a stop countersink for a specific fastener hole location.
- Select and apply the correct deburring / chamfering tool.
- Identify and wear Personal Protection Equipment (PPE) and safe drilling apparel.
- Demonstrate proper drill motor ergonomics while drilling fastener holes in aluminum structures.
- Drill holes in Aluminum that meet quality requirements.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP 1 Reason abstractly and quantitatively. MP6 Attend to precision. S-ID.A Summarize, represent, and interpret data on a single count or measurement variable. S-IC.B Make inferences and justify conclusions from sample surveys, experiments and observational studies. S-MD.A Calculate expected values and use them to solve problems.
Lesson 2	MP4 Model with mathematics MP5: Use appropriate tools strategically. MP6: Attend to precision. N-Q.A: Reason quantitatively and use units to solve problems. N-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects.
Health & Fitness	

Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

Unit 8: Cutting & Grinding	**Hours: 20**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- [1]Lab Project: Making a Star

Lesson 2:

- [1]Lab Project: Square Up a Block, Including Tramming
- [1]Booklet includes:
  - Worksheet: Calculating the RPM for Milling Machines
  - Worksheet: Feed Rate
  - Worksheet: Identify Parts of Milling Machine
  - Notes and Worksheet: Cartesian Plane Practice

Lesson 3:

- [1]Lab Project: Lathe Component

Lesson 4:

- Cutting & Grinding Quiz
- [1]Lab Project: Surface Grinding Project

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Adhere to machine shop safety guidelines.
- Demonstrate knowledge of sawing vocabulary.
- Select the appropriate cutting tool.
- Compare and contrast horizontal and vertical band saws.
- Demonstrate safety guidelines specific to horizontal and vertical band saws.

- Apply their knowledge of band saws with a hands-on project.
- Understand the primary uses and benefits of a milling machine.
- Calculate the RPM and Feed Rate of a milling machine.
- Draw and model plotting on the Cartesian 2-D and 3-D planes.
- Critically examine the factors to consider before using a milling machine.
- Demonstrate knowledge of the safety SOP's of a milling machine.
- List the parts of a milling machine.
- Build a project using a milling machine.
- Describe the features of an engine lathe.
- Identify the primary uses of a lathe.
- Describe a lathe's operating procedure.
- Demonstrate knowledge of the safety SOP's of a lathe.
- Use appropriate tooling to produce the project part.
- Explain the primary uses of a surface grinder.
- Demonstrate knowledge on how surface grinders work.
- Exhibit awareness of how to select the appropriate grinding wheel for a workpiece.
- Describe the SOP's of a surface grinder.
- Apply their knowledge of a surface grinder machine by grinding a part (assuming a surface grinder is available).

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	[1]Lab Project: Making a Star MP1 Make sense of a problem and persevere in solving them. MP4 Model with mathematics

	N-Q.A Quantities - Reason quantitatively and use units to solve problems. A-SSE.A Interpret the structure of expressions. A-SSE.A.1.A Interpret parts of an expression, such as terms, factors, and coefficients. A-SSE.A.2 Write expressions in equivalent forms to solve problems. G-SRT.D Apply trigonometry to general triangles. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects. G-MG.A Apply geometric concepts in modeling situations. G-MG.A.3 Apply geometric methods to solve design problems.
Lesson 2	[1]*Lab Project: Square Up a Block, Including Tramming (in Addendum)* MP4 Model with mathematics MP5 Use appropriate tools strategically MP6 Attend to precision N-Q.A Quantities - Reason quantitatively and use units to solve problems. N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. G-MG.A Visualize relationships between two-dimensional and three-dimensional objects. G-MG.A.3 Apply geometric methods to solve design problems. [1]*Instructor and Student Booklet* *Worksheets: RPM and Feed Rate calculations* MP6 Attend to precision. N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. *Cartesian Plane* MP4 Model with mathematics G-MD.B Visualize relationships between two-dimensional and three-dimensional objects.
Lesson 3	[1]*Lab Project: Lathe Component* MP4 Model with mathematics MP5 Use appropriate tools strategically MP6 Attend to precision N-Q.A Quantities - Reason quantitatively and use units to solve problems. N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. G-MG.A Visualize relationships between two-dimensional and three-dimensional objects. G-MG.A.3 Apply geometric methods to solve design problems.
Lesson 4	[1]*Lab Project: Surface Grinder* MP5 Use appropriate tools strategically MP6 Attend to precision N-Q.A Quantities - Reason quantitatively and use units to solve problems. N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Health & Fitness	

Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

Unit 9: Riveting	**Hours: 10**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Practice Review

Lesson 2:

- [1]Riveting Installation Activity
- Riveting Project Questions
- [1]Worksheet: Rivets – What's the Chance?

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Understand basic rivet gun usage and rivet die selection.
- Identify and describe the features of solid shank rivets.
- Distinguish between the two most common types of rivet heads.
- Demonstrate how rivet length is measured with a grip gage.
- Apply knowledge to select and use the appropriate bucking bar for a particular rivet installation.
- Specify the rivet removal process and when it might be required.
- Explain how to rivet parts together permanently using a rivet gun and bucking bar.
- Classify rivet installations as acceptable or unacceptable according to industry standards.
- Measure and lay-up a sheet metal project.
- Drill holes at correct points.
- Operate an automatic hole punch.
- Operate a Throatless shear.
- Operate a box brake to bend sheet metal.

- Assemble parts using Cleco fasteners.
- Rivet parts together permanently using a rivet gun and bucking bar.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 2	[1]*Riveting Installation Activity* MP5 Use appropriate tools strategically MP6 Attend to precision N-Q.A Quantities - Reason quantitatively and use units to solve problems. N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. [1]*Worksheet: Rivets – What's the Chance?* MP8 Look for and express regularity in repeated reasoning. SS-CPA.A Understand independence and conditional probability and use them to interpret data. SS-CPA.A.3 Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*. SS-CP.B Use the rules of probability to compute probabilities of compound events. SS-CP.B.6 Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model. SS-CP.B.8 (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately.

	1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

Unit 10: Print Reading	**Hours: 30**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- PowerPoint Activities
- [1] Activities: Identifying Lines and Interpreting Drawings

Lesson 2:

- PowerPoint Activities
- [1]Activity: Orthographic View Drawing Worksheet #1: Drawing a Book
- [1]Activities: Creating Cutouts, Isometric and Orthographic Drawings of Cut-Outs, More Orthographic Drawings
- [1]Activity: Identifying Sectional Views Worksheet
- [1]Activity: Practice Review on Views
- [1]Activity: Lines and Symbols Worksheet

Lesson 3:

- [1]Unit Project: Constructing and Drawing a Sliced Cube within Tolerance
- [1]Group Activity: Guessing Production Tolerance

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Understand fundamental terminology related to prints and drawings.
- Recognize drawing categories.
- Apply drawing authorities.
- Recognize and interpret the elements found on a picture sheet.
- Locate the Title Block on a drawing and identify the name, purpose of a drawing, and other fields depicted.
- Interpret geometric elements in a drawing.
- Identify the Alphabet of Lines.

- Interpret and construct isometric views.
- Interpret and construct an orthographic view.
- Identify types of views, including detail views, sectional views, auxiliary views, and be able to interpret cutting lines.
- Interpret common drawing symbols used in industry.
- Identify types of dimensioning: linear, progressive, typical, equally spaced, angles, arcs, cylinders, holes, size, location, baseline, and tabular.
- Explain the purpose of tolerances.
- Calculate decimal and fraction tolerances.
- Identify classes of fits.
- Construct a model within tolerance, given a drawing.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP4: Model with mathematics. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects G-GMD.B.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
Lesson 2	MP4: Model with mathematics. MP5: Use appropriate tools strategically. N-Q.A Reason quantitatively and use units to solve problems. G-CO.A Experiment with transformations in the plane G-CO.A.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects G-GMD.B.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-

	dimensional objects. G-MG.A Apply geometric concepts in modeling situations G-MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).*
Lesson 3	[1]*Unit Project: Constructing and Drawing a Sliced Cube within Tolerance* MP1: Make sense of problems and persevere in solving them. MP4: Model with mathematics. MP5: Use appropriate tools strategically. MP6: Attend to precision. N-Q.A Reason quantitatively and use units to solve problems. G-SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects G-GMD.B.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. G-MG.A Apply geometric concepts in modeling situations G-MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).* [1]*Group Activity: Guessing Production Tolerance* MP2: Reason abstractly and quantitatively. MP6: Attend to precision. N-Q.A Reason quantitatively and use units to solve problems. N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. S-IC.B Make inferences and justify conclusions from sample surveys, experiments, and observational studies S-IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

Unit 11: Applied Physics	Hours: 30

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- [1]Worksheets 1 and 2: Mass/Weight/Gravity and Density/Mass/Volume Calculations
- Lab: Which is More Dense?
- Quiz

Lesson 2:

- [1]Worksheet: Vectors
- Quiz

Lesson 3:

- [1]Mechanical Advantage Try These (PowerPoint)
- [1]Torque/Lever Activity (Addendum)
- Simple and Complex Machines Lab Activity (Addendum)
- Paper Airplane Contest (PowerPoint)

Lesson 4:

- Dust-Off Activity: Measuring Temperature (embedded in PowerPoint)
- [1]Worksheet: Converting BTU to ft-lb and vice versa (found in Addendum)
- [1]Worksheet: Calculate Thermal Expansion (found in Addendum)
- Psi Activity (embedded in PowerPoint)
- [1]Worksheet: Calculate Pressure (found in Addendum)
- [1]Suction Cup Activity (embedded in PowerPoint)

Lesson 5:

- [1]Worksheet: Gas Law Calculations (found in Booklet)
- Buoyancy Force 'Try These' (embedded in PowerPoint)
- Buoyancy Force Activity (found in Booklet)
- [1]Worksheet: Physics Conversions (found in Booklet)

Lesson 6:

- Laser Article and Question (found in Booklet)
- [1]Laser Level Activity (found in Booklet)
- Final Physics Exam (found in Addendum)

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Define physics.

- Explain the relationship between matter and mass, and name the three states of matter.
- Define weight and gravity, and how weight relates to mass.
- Solve for weight, mass and gravity using the given formula(s) and using appropriate units.
- Define density and solve for density, mass, volume using the given formula(s) and using appropriate units.
- Define Specific Gravity, and calculate a Specific Gravity ratio given density or weight of an object.
- Define energy, and name the two types of energy in objects.
- Define force, work and power.
- Apply the appropriate English and Metric units to force, work and power.
- Describe the force of friction.
- Apply torque and identify its units.
- Convert between Horsepower and watts.
- Define machines and identify simple machines.
- Distinguish between different types of levers and inclined planes.
- Define mechanical advantage and calculate it using force/distance variables.
- Solve for mechanical work using effort and resistance variables.
- Define stress and its effects; define motion.
- Distinguish between speed and velocity; explain how they are related to acceleration.
- Define heat, its relation to kinetic energy, and its units in both English and Metric.
- List and describe forms of energy which can be converted to heat.
- Explain how heat is transferred and list three methods of heat transfer.
- Define Thermal Efficiency.
- Define Specific Heat and solve for Thermal Expansion.
- Define pressure, list different pressure gauges, and practice solving for psi.
- Define gas laws, and use them to solve for pressure, temperature or volume.
- Identify the various components of air.
- Explain wave phenomena.
- Define wave vocabulary, including units.
- Identify the classifications of waves.
- Explain the electromagnetic spectrum in terms of why some waves are visible and others are not visible by the naked eye.
- Learn how light waves are used in industry.
- Summarize how lasers work and their uses in industry.
- Paraphrase specific safety guidelines when working with lasers.
- Explain how density is dependent on temperature and pressure.
- Define buoyancy and determine if something will sink or float using the buoyancy formula.
- Calculate conversion problems.
- Explain wave phenomena.
- Define wave vocabulary, including units.
- Identify the classifications of waves.
- Explain the electromagnetic spectrum in terms of why some waves are visible and others are not visible by the naked eye.
- Learn how light waves are used in industry.
- Summarize how lasers work and their uses in industry.
- Paraphrase safety guidelines when working with lasers.

- Construct a measurement tool using lasers.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	[1]*Worksheets 1 and 2: Mass/Weight/Gravity and Density/Mass/Volume Calculations* N.Q Reason quantitatively and use units to solve problems. N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. A.CED.A Create equations that describe numbers or relationships. A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R. A.REI.A Understand solving equations as a process of reasoning and explain the reasoning. A.REI.B Solve equations and inequalities in one variable. A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
Lesson 2	[1]*Embedded in PowerPoint and Assessed in Quiz* MP7: Look for and make use of structure. MP8: Look for and express regularity in repeated reasoning. N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. A.CED.A Create equations that describe numbers or relationships A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight

	resistance R. A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. [1]*Worksheet: Vectors* MP2: Reason abstractly and quantitatively. N-VM.A Represent and model with vector quantities. N-VM.A.1 (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v). N-V.B Perform operations on vectors. N-V.B.4 (+) Add and subtract vectors.
Lesson 3	[1]*Mechanical Advantage Try These* MP1: Make sense of problems and persevere in solving them. A-REI.B Solve equations and inequalities in one variable A-REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. High School: Modeling [1]*Torque/Lever Activity* MP1: Make sense of problems and persevere in solving them. MP4: Model with mathematics. MP5: Use appropriate tools strategically. MP6: Attend to precision. A-REI.B Solve equations and inequalities in one variable A-REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. High School: Modeling
Lesson 4	*Worksheets: BTU Conversions, Thermal Expansion, Pressure Calculations (see Addendum for Worksheets) and Suction Cup Activity (embedded in PowerPoint)* MP5: Use appropriate tools strategically. MP7: Look for and make use of structure. MP8: Look for and express regularity in repeated reasoning. N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. A.CED.A Create equations that describe numbers or relationships. A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R. A.REI.A Understand solving equations as a process of reasoning and explain the reasoning. A.REI.B Solve equations and inequalities in one variable. A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
Lesson 5	[1]*Gas Law Calculations (Booklet)* MP6: Attend to precision.

	MP7: Look for and make use of structure. A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R. [1]*Conversions (Booklet)* MP6: Attend to precision. MP7: Look for and make use of structure. N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
Lesson 6	[1]*Student Project: Laser Levels* MP2: Reason abstractly and quantitatively. MP4: Model with mathematics. MP5: Use appropriate tools strategically. MP6: Attend to precision. N.Q.A Reason quantitatively and use units to solve problems. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects. G-MG.A Apply geometric concepts in modeling situations G-MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

Unit 12: Math for Industry	**Hours: 30**
Performance Assessment(s): Assessments will be formal and informal, written, verbal and practical. Lesson 1:	

- [1]Online Work: oli.cmu.edu STEM Readiness, Module 8: Triangles
- [1]Lab Project: 'Designing a Footbridge with Trusses'.

Lesson 2:

- [1]Lab Project: 'Building a Footbridge with Trusses'.

Lesson 3:

- [1]Online Work: oli.cmu.edu STEM Readiness, Module 9: Cartesian Plane
- [1]Lab Project: Testing Your Footbridge

Lesson 4:

- [1]18 Tasks
- [1]6 Smarter Balanced Math Lesson Plans
- [1]SBA Math Practice Assessment

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Identify and name an angle.
- Measure an angle using a protractor.
- Classify triangles by their angles as right, obtuse, or equilateral.
- Classify triangles by their sides as equilateral, isosceles, or scalene.
- Use the triangle angle sum theorem to determine the measure of an angle in a triangle.
- Determine the measure of an angle by applying the concept of complementary or supplementary angles.
- Identify corresponding sides and angles in similar triangles.
- Determine corresponding angles and sides of similar triangles, using proportions.
- Apply the Pythagorean Theorem to calculate the length of a side of a right triangle.
- Calculate all angles and sides of a right triangle using trigonometry.
- Visualize relationships between two-dimensional and three-dimensional objects.
- Apply geometric concepts in modeling situations.
- Reason quantitatively and use units to solve problems.
- Describe the layout and identify the quadrants of the Cartesian coordinate system.
- Given the point on a graph, determine the ordered pair.
- Given a point on a graph, recognize whether an ordered pair is an x or y intercept.
- Graph points on the coordinate plane given an ordered pair.
- Visually identify whether the slope of a line is positive, negative, zero or undefined.
- Given the coordinates of two points on a line, determine the slope.
- Given data modeling a situation, interpret its slope.
- Given the coordinate of two points on a line, determine its linear equation.
- Given a linear equation, graph a line on the coordinate plane.
- Calculate the midpoint between two points on a line.
- Calculate the distance between two points.
- Given points on a graph, determine a best fit line.

- Represent a constraint by shading the correct side of the inequality line.
- Understand how combining inequalities affects a solution space.
- Interpret a situation and represent the constraints and variables mathematically.
- Select appropriate mathematical methods to use.
- Explore the effects of systematically varying the constraints.
- Interpret and evaluate generated data and identify the optimum case, checking it for confirmation.
- Communicate mathematical reasoning clearly.
- Find, based on equations, lines that are parallel and perpendicular.
- Identify and use intercepts.
- Understanding how the factored form of the function can identify a graph's roots.
- Understanding how the completed square form of the function can identify a graph's maximum or minimum point.
- Understanding how the standard form of the function can identify a graph's intercept.
- Articulate verbally the relationships between variables arising in everyday context.
- Translate between everyday situations and sketch graphs of relationships between variables.
- Interpret algebraic functions in terms of the contexts in which they arise.
- Reflect on the domains of everyday functions and in particular whether they should be discrete or continuous.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Unit Wide	MP1: Make sense of problems and persevere in solving them. MP2: Reason abstractly and quantitatively. MP3: Construct viable arguments and critique the reasoning of others. MP4: Model with mathematics. MP5: Use appropriate tools strategically.

	MP6: Attend to precision. MP5: Use appropriate tools strategically. MP7: Look for and make use of structure. MP8: Look for an express regularity in repeated reasoning.
Lesson 1	N-Q.A Reason quantitatively and use units to solve problems. N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.2A. Define appropriate quantities for the purpose of descriptive modeling. A.REI.B Solve equations and inequalities in one variable. A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. G.CO.D Make geometric constructions G.CO.D.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). G.SRT.A Understand similarity in terms of similarity transformations G.SRT.A.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. G.SRT.C Define trigonometric ratios and solve problems involving right triangles. G.SRT.C.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G.GMD.B Visualize relationships between two-dimensional and three-dimensional objects. G.MG.A Apply geometric concepts in modeling situations G.MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Lesson 2	N-Q.A Reason quantitatively and use units to solve problems. G.CO.D Make geometric constructions G.CO.D.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). G.GMD.B Visualize relationships between two-dimensional and three-dimensional objects. G.MG.A Apply geometric concepts in modeling situations G.MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Lesson 3	N-Q.A Reason quantitatively and use units to solve problems. A.REI.B Solve equations and inequalities in one variable. A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F.IF.B Interpret functions that arise in applications in terms of the context. F.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. F.IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.* F.LE.B Interpret expressions for functions in terms of the situation they model. F.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context.

	G.GPE.B Use coordinates to prove simple geometric theorems algebraically G.GPE.B.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables. S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S.ID.B.6.a Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. S.ID.B.6.b Informally assess the fit of a function by plotting and analyzing residuals. S.ID.B.6.c Fit a linear function for a scatter plot that suggests a linear association. Interpret linear models S.ID.C Interpret linear models. S.ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
Lesson 4	N.RN.A Extend the properties of exponents to rational exponents. N.RN.A.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{\frac{1}{3}}$ to be the cube root of 5 because we want $(5^{\frac{1}{3}})^3$ = $(5^{\frac{1}{3}})^3$to hold, so $(5^{\frac{1}{3}})^3$ must equal 5 . N.RN.A.2 Rewrite expressions involving radicals and rational exponents using properties of exponents. N-RN.B Use properties of rational and irrational numbers A-SSE.A Interpret the structure of expressions. A-SSE.A.2 Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$. A-SSE.B Write expressions in equivalent forms to solve problems. A-SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain A-SSE.B.3.a Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. A-APR.A Perform arithmetic operations on polynomials. A-APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. A.APR.B Understand the relationship between zeros and factors of polynomials. A.APR.B.2 Know and apply the Remainder Theorem: For a polynomial *p*(*x*) and a number *a*, the remainder on division by *x* - *a* is *p*(*a*), so *p*(*a*) = 0 if and only if (*x* - *a*) is a factor of *p*(*x*). A.APR.B.3 Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. A-CED.A Create equations that describe numbers or relationships. A-CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. A.REI.B Solve equations and inequalities in one variable. A.REI.B.4 Solve equations and inequalities in one variable. A.REI.C Solve systems of equations. A.REI.C.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$. A.REI.D Represent and solve equations and inequalities graphically A.REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

	*A.REI.D.11 Explain why the *x*-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. F-IF.C Analyze functions using different representations. F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. F-IF.C.7.a Graph linear and quadratic functions and show intercepts, maxima, and minima. F-IF.C.7.c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. F-LE.A Construct and compare linear, quadratic, and exponential models and solve problems. S.IC.B Make inferences and justify conclusions from sample surveys, experiments, and observational studies. S.IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

Unit 13: Rigging	**Hours: 30**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Load Characterization Activity Worksheets:
  - [1]Converting Dimensions
  - [1]Practicing Volume and Weight
  - [1]Center of Gravity
- Practice Review/Quiz

Lesson 2:

- Knowledge Assessment Quiz

Lesson 3:

- Knowledge Assessment Quiz
- [1]Activity: Practice lift and movement of a load

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Refer to the ANSI/ASME standards that are observed regarding lifting and moving loads
- List, explain and answer the four questions that must be asked before planning a lift or move.
- Given a set of circumstances, predict whether a proposed load movement would be classified as a critical lift, pre-engineered lift, or ordinary lift.
- State the four major steps in planning a move, including two elements of what to look for in each step.
- Apply elements of an ordinary lift plan to an actual lift.
- Measure and determine the volume of a load.
- Convert measurements expressed in different units into common units.
- Calculate the weight of a load.
- Determine the Center of Gravity(C/G) for a symmetrical load.
- Determine the Center of Gravity (C/G) for an asymmetric load.
- Recall and describe the four major steps in planning a move.
- Recall and list the elements of an ordinary lift plan
- Identify types of rigging, describe their features, and explain uses & inspection criteria.
- Differentiate in detail between three examples of steel rigging and three examples of synthetic rigging
- Select and inspect rigging for an actual load lift and movement
- Distinguish between the various types of cranes, hoists and lifting devices encountered at a worksites
- Conduct a pre-operational crane or hoist inspection.
- Rig a load for lift and movement
- State and describe the last of the four major steps in planning a move.
- Rig a load.
- Perform hand signals to direct the load movement.
- Lift and move a load safely using a hoist, or crane if available.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	

Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	[1]*Worksheet: Converting Dimensions* MP2: Reason abstractly and quantitatively. MP6: Attend to precision. N-Q.A Reason quantitatively and use units to solve problems. N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. [1]*Worksheet: Practicing Volume and Weight* MP1: Make sense of problems and persevere in solving them. MP6: Attend to precision. N-Q.A Reason quantitatively and use units to solve problems. N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. G.GMD.A Explain volume formulas and use them to solve problems. G.GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. G.GMD.B Visualize relationships between two-dimensional and three-dimensional objects. [1]*Worksheet: Center of Gravity* MP1: Make sense of problems and persevere in solving them. MP2: Reason abstractly and quantitatively. MP4: Model with mathematics. MP6: Attend to precision. N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. G.GMD.B Visualize relationships between two-dimensional and three-dimensional objects.
Lesson 2	MP4: Model with mathematics. G-MG.A Apply geometric concepts in modeling situations. G-MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Lesson 3	MP1: Make sense of problems and persevere in solving them. MP6: Attend to precision. N-Q.A Reason quantitatively and use units to solve problems. G.GMD.A Explain volume formulas and use them to solve problems. G.GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. G-MG.A Apply geometric concepts in modeling situations G-MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

Unit 14: Hydraulics and Pneumatics	**Hours: 30**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Quiz: A hydraulics quiz is available (Addendum)
- [1]Worksheet 1: Pascal's Law Calculations (Booklet)
- [1]Worksheet 2: More Pascal's Law (Booklet)
- [1]Worksheet 3: More Formulas, More Practice (Booklet)
- Reading and Journaling: How Hydraulic Machines Work by Marshall Brain (Booklet)

Lesson 2:

- Activity: Have students take apart some cheap air compressors to see how they work.
- [1]Activity: What Would It Cost to Set Up a Simple Pneumatic System?
- Lab Activity: Tennis Balls Up in the Air

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Explain the physics guiding hydraulics.
- Calculate problems related to fluid power using Pascal's Law, Force, Work, and Power equations.
- Identify the major historical events (and figures) behind the science of fluids.
- Describe the advantages and disadvantages of fluid power.
- Identify and explain the factors to consider when setting up a hydraulic system.
- Define terminology common to hydraulics.
- List the typical components of a basic hydraulics system.
- Recognize the fluid power components from schematics.

- Learn and practice safe handling procedures of hydraulics.
- Apply the knowledge of hydraulics with a hands-on project.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP1: Make sense of problems and persevere in solving them. MP2: Reason abstractly and quantitatively. MP7: Look for and make use of structure. N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. A.CED.A Create equations that describe numbers or relationships. A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*
Lesson 2	MP4: Model with mathematics. N.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. High School Modeling
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.

Social Studies	
Art	
Science	

Unit 15: Electrical	Hours: 35

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Practice Review/Quiz

Lesson 2:

- Practice Review/Quiz
- In-class activity: Visualizing a Magnetic Field

Lesson 3:

- Practice Review/Quiz

Lesson 4:

- Knowledge Assessment
- In-class activity: Creating a Basic Bread Board Electrical Circuit
- [1]Math Worksheet
- Student Handout

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Describe the basic structure of the atom.
- Define the term: Electron.
- Define the term: Proton.
- Define the term: Neutron.
- Define the term: Valence Shell.
- Define the term: Negative Ion.
- Explain the characteristics of insulators, semiconductors, and conductors.
- Describe how an atom becomes an ion.
- Explain the process of current flow.
- List the six sources of electricity and explain how they produce electrical pressure.
- List the requirements of an electrical circuit.

- Define voltage and its unit of measurement, then write the letter abbreviation for the unit.
- Define current and its unit of measurement, then write the letter abbreviation for the unit.
- Define resistance and its unit of measurement, then write the letter abbreviation for the unit.
- Define power and its unit of measurement, then write the letter abbreviation for the unit.
- Define conductance and its unit of measurement, then write the letter abbreviation for the unit.
- List the factors that determine resistance of wires, their current carrying capacity, and be able to size them.
- Describe the construction of various types of variable resistors and explain the applications they are used for.
- Describe the operation, terms and symbols of circuit protection devices.
- Identify standardized symbols used in schematic diagrams that represent various electronic components.
- Following a schematic diagram, assemble a simple electric circuit.
- Describe the relationships of current, voltage, and resistance.
- Use Ohm's Law equations to solve for electrical circuit values.
- Describe the importance of observing electrical safety.
- Describe the fundamental concepts of electricity.
- Describe grounding.
- Describe how different current levels affect the human body.
- Describe the ways in which electric shock can be received.
- List the steps that should be followed when treating an individual who receives an electric shock.
- Describe the causes and dangers of burns caused by electricity.
- Describe various practices that should be followed to prevent electrical hazards.
- Describe how certain types of electrical devices are engineered to prevent electrical hazardous conditions from occurring.
- Summarize the laws of magnetic attraction and repulsion.
- List the five characteristics of magnetic flux lines.
- Define magnetomotive force (MMF)
- Define magnetic flux.
- Define reluctance as a phenomenon regarding magnetism.
- Define permeability as a phenomenon regarding magnetism.
- Discuss residual magnetism and retentivity.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	

Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 4	MP1: Make sense of problems and persevere in solving them. MP7: Look for and make use of structure. N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. A.CED.A Create equations that describe numbers or relationships. A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R*. A.REI.A Understand solving equations as a process of reasoning and explain the reasoning. A.REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. A.REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. A.REI.B Solve equations and inequalities in one variable. A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

Unit 16: Soldering	**Hours: 25**
Performance Assessment(s): Assessments will be formal and informal, written, verbal and practical. Lesson 1:	

- [1]Worksheet: Eutectic Functions (Addendum)
- Practice Review Assessment

Lesson 2:
- Practice Review/Quiz
- In-class activity # 1: Hand soldering wires to terminals

Lesson 3:
- Practice Review/Quiz
- In-class activity # 2: Sweating Plumbing Connections

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:
- Define the process of soldering, distinguishing the difference between welding, brazing, and soldering
- Apply safety precautions when soldering
- Identify the base metal, solder and flux involved in a typical soldering task
- Explain the role of capillary action in the soldering process
- Distinguish between soft soldering, hard soldering and brazing, including differences in solder and temperatures required
- Relate typical applications where soldering is used
- List common solder alloys and sequence the ratios of common lead-tin alloy solders
- Explain eutectic solder and the properties that make it unique
- List the various forms of solder available and explain the applications in which each is used
- Identify at least three weights and gauges of commonly available solder wire
- Describe the purpose of flux and specify the differences between resin flux and acid flux
- List the general steps involved in the soldering process
- Describe soldering equipment and choose the best type for the assigned task
- Use the solder code to identify the solder type.
- Remove the wire insulation and Tin wires and components
- Solder the required number of prepared wires to terminations
- Rework discrepant soldered terminations
- Measure and cut a length of copper pipe using a pipe cutter or hacksaw
- Deburr and clean the base metal at the joint
- Apply flux and heat copper piping for soldering
- Solder a joint between two copper pipes according to industry standards
- Clean excess flux from a soldered copper piping joint

Aligned Washington State Standards

CCSS English/Language Arts: *Reading*

CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP1: Make sense of problems and persevere in solving them. MP2: Reason abstractly and quantitatively. N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. F.IF.A Understand the concept of a function and use function notation. F.IF.A.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x). F.IF.B Interpret functions that arise in applications in terms of the context. F.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* F.IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	

Science	

Unit 17: Troubleshooting	**Hours: 25**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Practice Review/Quiz
- In-class Activity: Online Research

Lesson 2:

- In-class Activity # 1: Troubleshooting Faulty Flashlights (Addendum)
- [1]In-class Activity # 2: Statistical Process Control (Math Activity in Addendum))
- Knowledge Assessment Quiz (Addendum)

Lesson 3

- Practice Review/Quiz

Lesson 4

- In-class Activity: Troubleshooting Leaf Blowers

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- State the seven phases in logical troubleshooting in the proper sequence.
- Define in their own words each phase of the seven-phase troubleshooting process.
- State the advantages of using this logical troubleshooting process.
- Explain how to distinguish between intermittent symptoms and reproducible symptoms.
- Differentiate between symptom recognition and symptom elaboration.
- Evaluate the advantages of keeping a troubleshooting log.
- Describe the types of information that are normally recorded in a troubleshooting log.
- Articulate the questions that need to be asked during the troubleshooting tech's face-to-face interview with the operator.
- Describe the correct way to record operator speculation about the root cause problem.
- Distinguish between electrical schematics and wiring diagrams.
- Relate how a troubleshooter "brackets" or "traps" the problem by conducting a series of tests to progressively pin down the root cause within the smallest possible function, sub-assembly, area, circuit or component.
- Order the tests and checks logically, once the probable faulty functions have been listed.
- Specify the questions that must be answered to confirm that the problem and associated symptoms have been corrected.
- Recommend actions to prevent future problems.
- Research, design, create and prepare informal documents suitable for the workplace.

- Interact collaboratively with other students to complete the activity assignment.
- Design a usable, clear, accessible document to capture relevant information needed to reconstruct the troubleshooting process
- Evaluate their documents to be sure that the documents fulfill their purpose and to ensure that they can be revised if necessary.
- Evaluate a case study and identify the proper sequence of the seven phases in logical troubleshooting.
- Sequence and undertake each phase of the seven-phase troubleshooting process while conducting a hands-on troubleshooting activity.
- Record data, actions, assumptions, findings, tests, and results in a troubleshooting log.
- Predict a root cause based upon symptoms.
- Evaluate observations to determine the actual root cause of a faulty symptom.
- Interact collaboratively with other students to complete the activity assignment.
- Define the concept of Root Cause Analysis.
- List the steps for performing Root Cause Analysis.
- Explain what is meant in Root Cause Analysis by the term “defining the problem.”
- Describe ways that evidence and data are gathered for analysis.
- Summarize the various basic tools and methods available for performing root cause analysis.
- Compare and explain examples of the “Five Whys” technique.
- Apply the “Five Whys” technique to determine the root cause of a problem.
- Draw a blank example of a Fishbone/Ishikawa diagram.
- Explain how a Fishbone diagram allows troubleshooters to determine root causes and contributing factors that create a fault or symptom.
- [1]Identify a Pareto chart and indicate the root causes displayed that have the biggest negative impact on quality or the manufacturing process.
- Recognize features of the Six Sigma approach and explain the acronym DAMAIC.
- Sequence and undertake each phase of the seven-phase troubleshooting process while conducting a hands-on troubleshooting activity on a multisystem machine (leaf blower).
- Record data, actions, assumptions, findings, tests, and results in a troubleshooting log.
- Predict a root cause based upon symptoms.
- Evaluate observations to determine the actual root cause of a faulty symptom.
- Determine corrective action to eliminate the root cause of the symptom.
- Interact collaboratively with other students to complete the activity assignment.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	

Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 2	MP1: Make sense of problems and persevere in solving them. MP2: Reason abstractly and quantitatively. MP3: Construct viable arguments and critique the reasoning of others. S.ID.A Summarize, represent, and interpret data on a single count or measurement variable S.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots). S.ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. S.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
Lesson 3	MP2: Reason abstractly and quantitatively. S-IC.B Making inference and justifying conclusions. S-IC.B.3 Make inferences and justify conclusions from sample surveys, experiments, and observational studies: Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

Unit 18: Lean/Manufacturing Processes and Principles	**Hours: 35**
Performance Assessment(s): Assessments will be formal and informal, written, verbal and practical. Lesson 1:	

- Article and Questions: ‘Castings vs. Foundry: What’s the Difference?’ by Brad Done
- [1]Designing and Making Whistles
- [1]Worksheet: Modeling Production

Lesson 2:

- Reading: ‘Waste’ in Student Booklet, answer questions that follow.
- Reading: ‘The Value of Time’ in Student Booklet, answer questions that follow.
- Reading: ‘Team Evolution’ in Student Booklet, answer questions that follow.
- Marshmallow Game
- Four Cup Activity.
- [1]5S Game
- [1]Lean Gummy Bears in Space
- Bottleneck Activity
- Quiz

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Compare and contrast making vs. manufacturing.
- Describe a brief history of manufacturing.
- Summarize manufacturing processes: Casting and Foundry, Forming and Metalworking, Machining, Joining and Assembly, Rapid Prototyping, Material Specific (plastics and ceramics) and Surface Treatment.
- Select which manufacturing process(es) to use according to the workpiece specifications.
- Classify manufacturing shops by their function(s).
- Explain how time and cost factor into the manufacturing process.
- Design and manufacture a whistle, simulating a job shop.
- Identify how Lean principles help companies compete in a global economy.
- Differentiate between value-added versus non value-added activities.
- Identify the eight wastes of Lean and how those wastes reduce an organization’s profits, competitive edge and customer satisfaction.
- Associate Lean tools with their ability to reduce manufacturing defects.
- Compare and contrast traditional push and pull systems.
- Understand how Lean principles allow companies to move toward just-in-time production.
- Define Six Sigma and explain how it complements Lean.
- List each step of the Six Sigma DMAIC methodology.
- Utilize basic data analysis tools.
- Define the Theory of Constraints and how it is used to improve a bottleneck scenario.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	

CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP1 Make sense of problems and persevere in solving them. MP2 Model with mathematics Mathematical Modeling N-Q.A: Reason quantitatively and use units to solve problems. N-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
Lesson 2	MP1 Make sense of problems and persevere in solving them MP4 Model with mathematics Mathematical Modeling F-IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

The 21st Century Skills should be taught and assessed throughout the course. This table should be included at the end of this document.

21st Century Skills		
Check those that students will demonstrate in this course:		
LEARNING & INNOVATION **Creativity and Innovation** ☒ Think Creatively ☒ Work Creatively with Others ☒ Implement Innovations **Critical Thinking and Problem Solving** ☒ Reason Effectively ☒ **U**se Systems Thinking ☒ Make Judgments and Decisions ☒ Solve Problems **Communication and Collaboration** ☒ Communicate Clearly ☒ Collaborate with Others	**INFORMATION, MEDIA & TECHNOLOGY SKILLS** **Information Literacy** ☒ Access and /evaluate Information ☒ Use and Manage Information **Media Literacy** ☐ Analyze Media ☐ Create Media Products **Information, Communications and Technology (ICT Literacy)** ☐ Apply Technology Effectively	**LIFE & CAREER SKILLS** **Flexibility and Adaptability** ☒ Adapt to Change ☒ Be Flexible **Initiative and Self-Direction** ☒ Manage Goals and Time ☒ Work Independently ☒ Be Self-Directed Learners **Social and Cross-Cultural** ☒ Interact Effectively with Others ☒ Work Effectively in Diverse Teams **Productivity and Accountability** ☒ Manage Projects ☒ Produce Results **Leadership and Responsibility** ☒ Guide and Lead Others ☒ Be Responsible to Others

YEAR 1 MATERIAL COMPLETE.

Statewide Framework Document for: 150613

Standards may be added to this document prior to submission, but may not be removed from the framework to meet state credit equivalency requirement. The equivalency material is either embedded organically into the curriculum or called out through worksheets, activities, projects and standard assessments. Credit equivalency options are designed for Skills Centers (540 hours) or a two year or block period high schools (360 hours). 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 Science and 1 credit of 3rd year Math.

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.

Washington Mathematics Standards (Common Core State Standards) support foundational mathematical knowledge and reasoning. While it is important to develop a conceptual understanding of mathematical topics, and fluency in numeracy and procedural skills, teachers, should also focus on the application of mathematics to career fields to support the three (3) key shifts of CCSS. The Standards for Mathematical Practice develop mathematical habits of mind and are to be modeled and integrated throughout the course. Washington English Language Arts Standards.

Core Template		
Course:		**Total Framework Hours up to: 540**
CIP Code: 150613	☐ **Exploratory** ☒ **Preparatory**	**Date Last Modified: 01/28/2016**
Career Cluster: Manufacturing		**Cluster Pathway: Manufacturing Production Process Development**
Resources Used: Aerospace Joint Apprenticeship Committee (AJAC), American Society of Metals (ASM), Boeing, Federal Aviation Association (FAA), National STEM Consortium (NSC), Non-Destructive Resource Center (NDT), and other industry-accepted knowledge, skills and abilities (KSA).		

Unit 1: Materials Science	**Hours: 140**
Performance Assessments:	
Assessments will be formal and informal, written, verbal and practical:	
Lesson 1:	
• Handout: Scope and Sequence for Classifying Matter	
• Activity: General Comparison of Properties: Metals, Ceramics, Polymers Overhead	
• Introductory Activity – Oobleck	

- Activity: The Stuff of History
- Lab: A Physical Challenge Lab – Can elements be classified by physical properties?
- Lab: White Powder
- Lab: Materials ID
- Overheads/handouts: Classification of Materials
- Overheads/handouts: Types of Bonding
- Overheads/handouts: Types of Properties
- Handout: Materials ID Descriptions
- Student Booklet: Reading, Writing, and Activities

Lesson 2:

- Lab: Sulfur
- Lab: Rhombic Sulfur
- Lab: Amorphous Sulfur
- Activity 1: Copper Sulfate Demonstration (Growing single crystals)
- Activity 2: Phenyl Salicylate Demonstration
- Lab: Growing Silver Crystals
- Lab: Models of Crystals
- Activity: Iron Wire Demo
- Activity 3: Copper Wire Demonstration
- Lab: Heat – Treating Steel
- Lab: Heat Treating Iron
- Activity: Journaling
- Extra Activities: MAST Module Metals – Experiment 3 Processing Metals and Experiment 4 Tensile Strength Test for Various Metals
- Student Booklet: Reading, Writing, and Activities

Lesson 3:

- Lab: Metal Stations
    - Cost of a Penny
    - Brassing a Penny
    - Penny and Electricity (Rolling of a Penny)
- Lab: Reactivity of Metals
- Lab: Fruit Juice
- Lab: NACE Kit Labs
- Activity: Compression Ignition Demonstration
- Activity: Demonstration – Aluminum and HCl
- Activity: Aluminum Coating and Protection
- Student Booklet: Reading, Writing, and Activities

Lesson 4:

Module 1: Chemistry for Composites

Note: There are multiple activities and labs to choose from. Select which ones are appropriate for your class and where you have the equipment and supplies.

Addendum includes:

- Activity 1: Nylon Polymerization
- Activity 2: Match the Fabric to the Label
- Activity 3: Weaves
- Activity 4: Cardboard Laminate
- Lab: Honeycomb Panel
- Lab: Fiberglass Hand Layup
- Lab: Composite Panel Repair
- Lab: Foam Core Composites
- Lab: Wet Lay-Up
- Lab: Wet Lay-Up with Foam Core
- Lab: Wet Lay-Up in Mold
- Lab: Vacuum Bagging Wet Lay-Up
- Lab: Resin Infusion
- Lab: Vacuum Bagging PrePreg
- Lab: Vacuum Bagging PrePreg with Foam Core
- Lab: Vacuum Bagging PrePreg with Honeycomb
- Lab: Isotropic Panel (Clipboard), 2-Day Minimum

Module 2: Structure and Repair I

- Student Quiz

Module 3: Structure and Repair II

- Student Quiz

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects (individual and group), activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Explain the importance of materials sciences.
- Apply basic chemistry to explain physical and chemical characteristics of the four categories of materials.
- Apply knowledge of materials science to explain materials choices in design.
- Use critical thinking to evaluate and apply appropriate materials choice for specific applications.
- Demonstrate practical reasoning, and hands-on/minds-on, problem-solving skills in designing, fabricating, and constructing projects during the course.
- Use writing to record observations, procedures, and experiments and as a tool for thinking, studying, and learning the subject matter.
- Define materials science and how it has changed through history.
- Classify matter.
- Summarize the spatial relationships found on the Periodic Table of Elements.
- Define types of structure, crystalline vs. amorphous.
- Define types of bonding.
- Identify types of properties.
- Relate properties to types of bonding.
- Describe through writing and discussion the basic properties of materials: mechanical, thermal, chemical, optical, and magnetic.
- Characterize materials on the basis of chemical bonding and crystal structure.

- Distinguish between crystal structure and crystal system.
- Describe the relationship between atomic radius and lattice parameter.
- Compare and contrast crystalline and amorphous structures.
- Provide examples of materials that change among amorphous and crystalline states.
- Describe the effect of crystal defects and imperfections in material properties.
- List several common materials used in the design and construction of structures.
- Define simple properties of materials, such as strength, flexibility, transparency.
- Select suitable materials for making a particular object based on their properties.
- Explain the advantages and disadvantages of common materials used in engineering structures.
- Distinguish between chemical and physical properties of a material.
- Differentiate between oxidation and reduction especially as they pertain to galvanic corrosion.
- Define thermal expansion.
- Evaluate the effects of thermal expansion on design considerations.
- Describe the response to force or stress using the terms: workability (malleability and ductility), brittleness, hardness, elasticity and plasticity, toughness and strength.
- Define mechanical properties: tensile strength, compression, fatigue, flexure, impact, torsion, hardness, and shear.
- Relate the physical characteristics of materials such as workability and brittleness to the mechanical properties such as tensile and compressive strength to impact design considerations.
- Describe composite materials.
- Explain the use of ancillary materials.
- Demonstrate basic fabrication techniques.
- Define fiber-reinforced composites.
- Discuss properties of composites.
- Recognize products made from fiber-reinforced composites.
- Explain the differences between polymers and composites.
- Explain the key differences between composites properties and metal properties.
- Calculate resin-fiber ratio.
- Fabricate a fiber reinforced composite part.
- Demonstrate safe fabrication practices.
- Define and prevent resin migration and materials contamination.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts Informational Technology: *Writing*	

CCSS English/Language Arts Informational Technology: *Speaking & Listening*	
CCSS English/Language Arts Informational Technology: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge.
CCSS Math	
Unit Wide	MP1. Make sense of problems and persevere in solving them MP 2. Reason abstractly and quantitatively. MP 4. Model with mathematics. MP 5. Use appropriate tools strategically. MP 6. Attend to precision. MP 7. Look for and make use of structure. MP 8. Look for and express regularity in repeated reasoning. N-Q.A Reason Quantitatively and use units to solve problems. N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. G-CO.A Experiment with transformation in the plane. G-SRT.A Understand similarity in terms of similarity transformation
Health and Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. HS-PS1-1

	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-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-ETS1-2	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 trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts

Unit 2: Shop Tools	**Hours: 20**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical:

Lesson 1:

- [1]Hand Tools ID Activity

Lesson 2:

- Class Discussion

Lesson 3:

- Power Shop Equipment Test

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

- Articulate tool use hazards and main causes for hand tool mishaps.

- List the workplace tasks that require hand tools to accomplish.
- Describe and select the appropriate hand tool to accomplish a particular workplace task.
- Distinguish between tools that are similar in appearance, stating the commonly used terms for each tool and normal routine application.
- Explain basic techniques and proper use of hand tools.
- Identify and use equipment and tools for manufacturing.
- Use portable power hand tools, including pistol grip drill motor, rivet gun, ratchet wrench, Microstop Countersink Cage, Lockbolt Puller, and Hi-Lok Ratchet Wrench, Nut Runner and Torque Wrench appropriately and safely.
- Interpret a drawing to lay out a job, including the placement of holes, and selection of appropriate tools and fasteners to perform the job.
- Use gages appropriately.
- Install Lockwire.
- Complete the job, per drawing specifications, in accord with the Instructor's performance criteria.
- Articulate general safety hazards associated with the operation of installed power shop equipment.
- List workplace tasks or functions that require power shop equipment to accomplish.
- Describe and select the appropriate power equipment to accomplish a particular workplace function.
- Explain the potential hazards of each individual power shop machine.
- List and point to the safety controls used for each power shop machine and items to inspect prior to use.
- Specify the features and major components of each shop machine in this Unit.
- Explain basic techniques and proper use of common power shop equipment and machinery, including the drill press, disk sander, belt sander, pedestal grinder, band saw, and the manual foot shear.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP5: Use appropriate tools strategically.

	MP6: Attend to precision. N-Q.A: Reason quantitatively and use units to solve problems. N-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 3: Safety	**Hours: 20**
COMPONENTS AND ASSESSMENTS	
Performance Assessments: Assessments will be formal and informal, written, verbal and practical: Lesson 1: • [1]Math Worksheet: Interpreting Occupational Injury and Illness Data • Test Lesson 2: • [1]Tombstone Project	
Leadership Alignment: Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.	
Industry Standards and Competencies	
• Student will be able to describe EHS programs • Student will be able to practice HazCom • Student will be able to practice Erognomics • Student will be able to describe regulations • Student will be able to model Human Factors • Student will be able to practice SOP	

- Student will be able to demonstrate and use PPE
- Student will be able to identify lockout/tagout
- Student will be able to practice hand powertool safety
- Student will be able to practice industrial housekeeping
- Student will be able to practice environmental safety
- Demonstrate safe practices, including choice of proper PPE, in the use of hand tools such as punch, files, deburring tools, shear, and brake.
- Demonstrate safe practices, including choice of proper PPE, in the use of hand held power tools such as drills.
- Demonstrate safe practices in the use of floor-mounted horizontal band saw and drill press.
- Locate, select, and interpret Material Safety Data Sheets (MSDS) for various materials called out in a project.
- Explain SOPs of the school laboratory.
- Evaluate a situation and design a safety alternative accounting for a range of constraints.
- Appropriately document the use of materials and manufacture of a project consistent with institution policy Quality Management System (QMS).

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts Informational Technology: *Writing*	
CCSS English/Language Arts Informational Technology: *Speaking & Listening*	
CCSS English/Language Arts Informational Technology: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP2: Reason abstractly and quantitatively S-IC.B Making inference and justifying conclusions S-IC.B.3 Make inferences and justify conclusions from sample surveys, experiments, and observational studies: Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
Lesson 2	MP4 Model with mathematics MP5: Use appropriate tools strategically. MP6: Attend to precision.

	N-Q.Q.A: Reason quantitatively and use units to solve problems. N-Q.Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. G-GMD.B Visualize relationships between two-dimensional and three-dimensional object G-GMD.B.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 4: Standard Operating Procedures	**Hours: 20**
COMPONENTS AND ASSESSMENTS	
Performance Assessments: Assessments will be formal and informal, written, verbal and practical: Lesson 1: • [1]Math Worksheet: Late to Work • Student Booklet: Readings, Questions, Assignments and Activities	
Leadership Alignment: Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.	
Industry Standards and Competencies	
Standard/Unit: • Define QMS. • Describe the “enterprise level” of QMS. • Explain the hierarchy of a manufacturing production order. • Identify and document a standardized process in their environment. • Demonstrate knowledge of SOP.	

- Evaluate and design revisions required for increase/effective the enterprise QMS.
- Define Root Cause Analysis in fundamental terms.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts Informational Technology: *Writing*	
CCSS English/Language Arts Informational Technology: *Speaking & Listening*	
CCSS English/Language Arts Informational Technology: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP2: Reason abstractly and quantitatively S-IC.B Making inference and justifying conclusions S-IC.B.3 Make inferences and justify conclusions from sample surveys, experiments, and observational studies: Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
Health & Fitness	
Social Studies	
Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 5: Precision Measurement	**Hours: 20**
COMPONENTS AND ASSESSMENTS	

Performance Assessment(s):
Assessments will be formal and informal, written, verbal and practical:
Lesson 1:

- [1]Math Worksheet: Solving for Radical Solutions
- [1]Student Booklet: Semi-Precision Measurement:
  - Using a Scale
  - Reading a Scale

Lesson 2:

- [1]Student Booklet: Geometric Dimensioning & Tolerancing

Lesson 3

- [1]Worksheets 1 and 2: Reading a Micrometer
- [1]Lab Activity: Practicing Precision Measurement
- [1]Exam: Measurement covers Lessons 1, 2, and 3
- [1]Student Booklet: Precision Measurement
  - 6-Inch Dial Calipers
  - Micrometers
  - Ball Gages

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Define Semi-Precision Measurement and identify units used.
- Explain the care and handling procedures of semi-precision measurement tools.
- Read a 1/64th English Rule (machinist's scale).
- Identify the Geometric Dimensioning and Tolerancing (GD&T) symbols that represent specific tolerances.
- Read a Feature Control Frame
- Define Precision Measurement and units used.
- Explain care and handling procedures of Precision Measurement tools, and the need and procedure for calibration.
- Identify the parts and read a caliper (Vernier and/or dial).
- Identify the parts, and read an outside Micrometer.

Aligned Washington State Standards

CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	[1]Math Worksheet: Solving for Radical Solutions (Addendum) MP1: Make sense of problems and persevere in solving them. A-REI.B: Reasoning with Equations and Inequalities. A-REI.B.4: Solve quadratic equations in one variable. [1] Semi-Precision Measurement Practice: Using and Reading a Scale MP5: Use appropriate tools strategically. MP6: Attend to precision. N-Q.A: Reason quantitatively and use units to solve problems. N-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Lesson 2	MP6: Attend to precision. G-GMD.B: Visualize relationships between two-dimensional and three-dimensional objects. G-MG.A: Apply geometric concepts in modeling situations. Use geometric shapes, their measures, and their properties to describe objects.
Lesson 3	MP5: Use appropriate tools strategically. MP6: Attend to precision. N-Q.A: Reason quantitatively and use units to solve problems. N-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N-Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Health & Fitness	

Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 6: Fasteners	**Hours: 10**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical:

Lesson 1

- [1]Worksheet - Thread Measurement: Three Wire Method
- Practice Review Quiz
- [1]Nut & Bolt Installation Activity

Lesson 2

- Practice Review Quiz
- [1]Permanent Fastener Installation Activity

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Identify the components of a fastening system using nuts & bolts
- Indicate and describe the standard features of bolts and nuts
- Specify the materials from which bolts & nuts are made
- Identify protruding bolt head style
- Summarize the use of lubricants and locking devices with nuts & bolts
- Distinguish between sheer and tension as types of stress/load on installed bolts
- List the four forces acting on installed bolts
- Explain the significance of measuring KSI Tensile strength and KSI Shear Strength
- Use a Grip Scale to verify bolt length
- Measure interior diameter of a drilled hole using a hole gage and micrometer
- Demonstrate the normal installation of bolts

- Categorize torque wrench types
- Properly operate a torque wrench
- Identify the components of a fastening system using hex-drive fasteners and lockbolts.
- Indicate and describe the standard features of hex-drive fasteners and lockbolts.
- Distinguish between Hi-Lite and Hi-Lok fasteners and explain the different uses for which they may installed.
- Using a power drill motor, socket and hex drive wrench, demonstrate the normal installation of hex-drive fasteners such as Hi-Lites and Hi-Loks.
- Distinguish protruding head from flush head fasteners.
- Explain the limitations and normal use of washers when installing fasteners on aircraft.
- Summarize inspection checks done after fastener installation.
- Demonstrate the proper removal of hex drive fasteners.
- Point out features of lockbolts, explaining how they are used to securely fasten parts or sheets of material together.
- State the safety considerations when using a lockbolt puller.
- Describe or demonstrate normal procedures for installation of lockbolt fasteners.
- Distinguish lockbolt installations that are acceptable from those that are unacceptable.

Aligned Washington State Standards	
CCSS English/Language Arts: Reading	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	[1]Worksheet - Thread Measurement: Three Wire Method MP4 Model with mathematics. MP5 Use appropriate tools strategically. F-BF.A.1.A Write a function that describes a relationship between two quantities. F-BF.A.1.B Build new functions from existing functions. [1]Nut & Bolt Installation Activity MP4 Model with mathematics MP5: Use appropriate tools strategically.

	MP6: Attend to precision. N-Q.B: Reason quantitatively and use units to solve problems. N-Q.B.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects.
Lesson 2	[1] Permanent Fastener Activity MP4 Model with mathematics MP5: Use appropriate tools strategically. MP6: Attend to precision. N-Q.A: Reason quantitatively and use units to solve problems. N-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 7: Drilling	**Hours: 10**
Performance Assessment(s): Assessments will be formal and informal, written, verbal and practical. Lesson 1: • [1]Worksheet: Keep Batch or Not? Standard Deviation • Practice Review Quiz Lesson 2:	

- Practice Review Quiz
- [1]Practical Drilling Activity

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Identify the characteristics of a properly drilled hole in aluminum in accordance with specifications and industry standards.
- State the importance of creating quality holes in aluminum structure.
- State the qualities of a properly drilled and accurate hole.
- Identify proper drilling equipment (Size, Type and Speed) required for drilling.
- Convert available fractional drill sizes to the required decimal equivalent drill bit needed, using the decimal equivalency card.
- Correctly select the drill guide for the drill bit being used.
- Define and explain the function to the component parts of a counter sink.
- Identify countersink cutters.
- Set a stop countersink for a specific fastener hole location.
- Identify the correct deburring / chamfering tool.
- Provide definition and function to the acceptable and preferred deburring tools.
- Define fastener relief requirements.
- Identify proper drilling equipment (Size, Type and Speed) required for drilling.
- Convert available fractional drill sizes to the required decimal equivalent drill bit needed for a task, using the decimal equivalency card to convert.
- Correctly select the appropriate drill guide for the drill bit being used.
- Set-up a stop countersink for a specific fastener hole location.
- Select and apply the correct deburring / chamfering tool.
- Identify and wear Personal Protection Equipment (PPE) and safe drilling apparel.
- Demonstrate proper drill motor ergonomics while drilling fastener holes in aluminum structures.
- Drill holes in Aluminum that meet quality requirements.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	

Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP 1 Reason abstractly and quantitatively. MP6 Attend to precision. S-ID.A Summarize, represent, and interpret data on a single count or measurement variable. S-IC.B Make inferences and justify conclusions from sample surveys, experiments and observational studies. S-MD.A Calculate expected values and use them to solve problems.
Lesson 2	MP4 Model with mathematics MP5: Use appropriate tools strategically. MP6: Attend to precision. N-Q.A: Reason quantitatively and use units to solve problems. N-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 8: Cutting & Grinding	**Hours: 20**
Performance Assessment(s): Assessments will be formal and informal, written, verbal and practical. Lesson 1:	

- [1]Lab Project: Making a Star

Lesson 2:

- [1]Lab Project: Square Up a Block, Including Tramming
- [1]Booklet includes:
    - Worksheet: Calculating the RPM for Milling Machines
    - Worksheet: Feed Rate
    - Worksheet: Identify Parts of Milling Machine
    - Notes and Worksheet: Cartesian Plane Practice

Lesson 3:

- [1]Lab Project: Lathe Component

Lesson 4:

- Cutting & Grinding Quiz
- [1]Lab Project: Surface Grinding Project

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Adhere to machine shop safety guidelines.
- Demonstrate knowledge of sawing vocabulary.
- Select the appropriate cutting tool.
- Compare and contrast horizontal and vertical band saws.
- Demonstrate safety guidelines specific to horizontal and vertical band saws.
- Apply their knowledge of band saws with a hands-on project.
- Understand the primary uses and benefits of a milling machine.
- Calculate the RPM and Feed Rate of a milling machine.
- Draw and model plotting on the Cartesian 2-D and 3-D planes.
- Critically examine the factors to consider before using a milling machine.
- Demonstrate knowledge of the safety SOP's of a milling machine.
- List the parts of a milling machine.
- Build a project using a milling machine.
- Describe the features of an engine lathe.
- Identify the primary uses of a lathe.
- Describe a lathe's operating procedure.
- Demonstrate knowledge of the safety SOP's of a lathe.
- Use appropriate tooling to produce the project part.
- Explain the primary uses of a surface grinder.
- Demonstrate knowledge on how surface grinders work.
- Exhibit awareness of how to select the appropriate grinding wheel for a workpiece.
- Describe the SOP's of a surface grinder.

- Apply their knowledge of a surface grinder machine by grinding a part (assuming a surface grinder is available).

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	[1]Lab Project: Making a Star MP1 Make sense of a problem and persevere in solving them. MP4 Model with mathematics N-Q.A Quantities - Reason quantitatively and use units to solve problems. A-SSE.A Interpret the structure of expressions. A-SSE.A.1.A Interpret parts of an expression, such as terms, factors, and coefficients. A-SSE.A.2 Write expressions in equivalent forms to solve problems. G-SRT.D Apply trigonometry to general triangles. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects. G-MG.A Apply geometric concepts in modeling situations. G-MG.A.3 Apply geometric methods to solve design problems.
Lesson 2	*[1]Lab Project: Square Up a Block, Including Tramming (in Addendum)* MP4 Model with mathematics MP5 Use appropriate tools strategically MP6 Attend to precision N-Q.A Quantities - Reason quantitatively and use units to solve problems. N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. G-MG.A Visualize relationships between two-dimensional and three-dimensional objects. G-MG.A.3 Apply geometric methods to solve design problems.

	[1]*Instructor and Student Booklet* *Worksheets: RPM and Feed Rate calculations* MP6 Attend to precision. N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. *Cartesian Plane* MP4 Model with mathematics G-MD.B Visualize relationships between two-dimensional and three-dimensional objects.
Lesson 3	[1]*Lab Project: Lathe Component* MP4 Model with mathematics MP5 Use appropriate tools strategically MP6 Attend to precision N-Q.A Quantities - Reason quantitatively and use units to solve problems. N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. G-MG.A Visualize relationships between two-dimensional and three-dimensional objects. G-MG.A.3 Apply geometric methods to solve design problems.
Lesson 4	[1]*Lab Project: Surface Grinder* MP5 Use appropriate tools strategically MP6 Attend to precision N-Q.A Quantities - Reason quantitatively and use units to solve problems. N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 9: Riveting	**Hours: 10**

Performance Assessment(s):
Assessments will be formal and informal, written, verbal and practical.
Lesson 1:

- Practice Review

Lesson 2:

- [1]Riveting Installation Activity
- Riveting Project Questions
- [1]Worksheet: Rivets – What's the Chance?

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Understand basic rivet gun usage and rivet die selection.
- Identify and describe the features of solid shank rivets.
- Distinguish between the two most common types of rivet heads.
- Demonstrate how rivet length is measured with a grip gage.
- Apply knowledge to select and use the appropriate bucking bar for a particular rivet installation.
- Specify the rivet removal process and when it might be required.
- Explain how to rivet parts together permanently using a rivet gun and bucking bar.
- Classify rivet installations as acceptable or unacceptable according to industry standards.
- Measure and lay-up a sheet metal project.
- Drill holes at correct points.
- Operate an automatic hole punch.
- Operate a Throatless shear.
- Operate a box brake to bend sheet metal.
- Assemble parts using Cleco fasteners.
- Rivet parts together permanently using a rivet gun and bucking bar.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	

Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 2	[1]*Riveting Installation Activity* MP5 Use appropriate tools strategically MP6 Attend to precision N-Q.A Quantities - Reason quantitatively and use units to solve problems. N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. [1]*Worksheet: Rivets – What's the Chance?* MP8 Look for and express regularity in repeated reasoning. SS-CPA.A Understand independence and conditional probability and use them to interpret data. SS-CPA.A.3 Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*. SS-CP.B Use the rules of probability to compute probabilities of compound events. SS-CP.B.6 Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model. SS-CP.B.8 (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 10: Print Reading	**Hours: 30**
Performance Assessment(s): Assessments will be formal and informal, written, verbal and practical. Lesson 1:	

- PowerPoint Activities
- [1] Activities: Identifying Lines and Interpreting Drawings

Lesson 2:

- PowerPoint Activities
- [1]Activity: Orthographic View Drawing Worksheet #1: Drawing a Book
- [1]Activities: Creating Cutouts, Isometric and Orthographic Drawings of Cut-Outs, More Orthographic Drawings
- [1]Activity: Identifying Sectional Views Worksheet
- [1]Activity: Practice Review on Views
- [1]Activity: Lines and Symbols Worksheet

Lesson 3:

- [1]Unit Project: Constructing and Drawing a Sliced Cube within Tolerance
- [1]Group Activity: Guessing Production Tolerance

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Understand fundamental terminology related to prints and drawings.
- Recognize drawing categories.
- Apply drawing authorities.
- Recognize and interpret the elements found on a picture sheet.
- Locate the Title Block on a drawing and identify the name, purpose of a drawing, and other fields depicted.
- Interpret geometric elements in a drawing.
- Identify the Alphabet of Lines.
- Interpret and construct isometric views.
- Interpret and construct an orthographic view.
- Identify types of views, including detail views, sectional views, auxiliary views, and be able to interpret cutting lines.
- Interpret common drawing symbols used in industry.
- Identify types of dimensioning: linear, progressive, typical, equally spaced, angles, arcs, cylinders, holes, size, location, baseline, and tabular.
- Explain the purpose of tolerances.
- Calculate decimal and fraction tolerances.
- Identify classes of fits.
- Construct a model within tolerance, given a drawing.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	

CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP4: Model with mathematics. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects G-GMD.B.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
Lesson 2	MP4: Model with mathematics. MP5: Use appropriate tools strategically. N-Q.A Reason quantitatively and use units to solve problems. G-CO.A Experiment with transformations in the plane G-CO.A.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects G-GMD.B.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. G-MG.A Apply geometric concepts in modeling situations G-MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).*
Lesson 3	[1]*Unit Project: Constructing and Drawing a Sliced Cube within Tolerance* MP1: Make sense of problems and persevere in solving them. MP4: Model with mathematics. MP5: Use appropriate tools strategically. MP6: Attend to precision. N-Q.A Reason quantitatively and use units to solve problems. G-SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects G-GMD.B.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. G-MG.A Apply geometric concepts in modeling situations

	G-MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).* [1]*Group Activity: Guessing Production Tolerance* MP2: Reason abstractly and quantitatively. MP6: Attend to precision. N-Q.A Reason quantitatively and use units to solve problems. N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. S-IC.B Make inferences and justify conclusions from sample surveys, experiments, and observational studies S-IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 11: Applied Physics	**Hours: 30**

Performance Assessment(s):
Assessments will be formal and informal, written, verbal and practical.
Lesson 1:

- [1]Worksheets 1 and 2: Mass/Weight/Gravity and Density/Mass/Volume Calculations
- Lab: Which is More Dense?
- Quiz

Lesson 2:

- [1]Worksheet: Vectors
- Quiz

Lesson 3:

- [1]Mechanical Advantage Try These (PowerPoint)
- [1]Torque/Lever Activity (Addendum)
- Simple and Complex Machines Lab Activity (Addendum)
- Paper Airplane Contest (PowerPoint)

Lesson 4:

- Dust-Off Activity: Measuring Temperature (embedded in PowerPoint)
- [1]Worksheet: Converting BTU to ft-lb and vice versa (found in Addendum)
- [1]Worksheet: Calculate Thermal Expansion (found in Addendum)
- Psi Activity (embedded in PowerPoint)
- [1]Worksheet: Calculate Pressure (found in Addendum)
- [1]Suction Cup Activity (embedded in PowerPoint)

Lesson 5:

- [1]Worksheet: Gas Law Calculations (found in Booklet)
- Buoyancy Force 'Try These' (embedded in PowerPoint)
- Buoyancy Force Activity (found in Booklet)
- [1]Worksheet: Physics Conversions (found in Booklet)

Lesson 6:

- Laser Article and Question (found in Booklet)
- [1]Laser Level Activity (found in Booklet)
- Final Physics Exam (found in Addendum)

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Define physics.
- Explain the relationship between matter and mass, and name the three states of matter.
- Define weight and gravity, and how weight relates to mass.
- Solve for weight, mass and gravity using the given formula(s) and using appropriate units.
- Define density and solve for density, mass, volume using the given formula(s) and using appropriate units.
- Define Specific Gravity, and calculate a Specific Gravity ratio given density or weight of an object.
- Define energy, and name the two types of energy in objects.
- Define force, work and power.
- Apply the appropriate English and Metric units to force, work and power.
- Describe the force of friction.
- Apply torque and identify its units.
- Convert between Horsepower and watts.
- Define machines and identify simple machines.
- Distinguish between different types of levers and inclined planes.
- Define mechanical advantage and calculate it using force/distance variables.

- Solve for mechanical work using effort and resistance variables.
- Define stress and its effects; define motion.
- Distinguish between speed and velocity; explain how they are related to acceleration.
- Define heat, its relation to kinetic energy, and its units in both English and Metric.
- List and describe forms of energy which can be converted to heat.
- Explain how heat is transferred and list three methods of heat transfer.
- Define Thermal Efficiency.
- Define Specific Heat and solve for Thermal Expansion.
- Define pressure, list different pressure gauges, and practice solving for psi.
- Define gas laws, and use them to solve for pressure, temperature or volume.
- Identify the various components of air.
- Explain wave phenomena.
- Define wave vocabulary, including units.
- Identify the classifications of waves.
- Explain the electromagnetic spectrum in terms of why some waves are visible and others are not visible by the naked eye.
- Learn how light waves are used in industry.
- Summarize how lasers work and their uses in industry.
- Paraphrase specific safety guidelines when working with lasers.
- Explain how density is dependent on temperature and pressure.
- Define buoyancy and determine if something will sink or float using the buoyancy formula.
- Calculate conversion problems.
- Explain wave phenomena.
- Define wave vocabulary, including units.
- Identify the classifications of waves.
- Explain the electromagnetic spectrum in terms of why some waves are visible and others are not visible by the naked eye.
- Learn how light waves are used in industry.
- Summarize how lasers work and their uses in industry.
- Paraphrase safety guidelines when working with lasers.
- Construct a measurement tool using lasers.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	

Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	[1]*Worksheets 1 and 2: Mass/Weight/Gravity and Density/Mass/Volume Calculations* N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. A.CED.A Create equations that describe numbers or relationships. A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R. A.REI.A Understand solving equations as a process of reasoning and explain the reasoning. A.REI.B Solve equations and inequalities in one variable. A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
Lesson 2	[1]*Embedded in PowerPoint and Assessed in Quiz* MP7: Look for and make use of structure. MP8: Look for and express regularity in repeated reasoning. N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. A.CED.A Create equations that describe numbers or relationships A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R. A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. [1]*Worksheet: Vectors* MP2: Reason abstractly and quantitatively. N-VM.A Represent and model with vector quantities. N-VM.A.1 (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v). N-V.B Perform operations on vectors. N-V.B.4 (+) Add and subtract vectors.
Lesson 3	[1]*Mechanical Advantage Try These* MP1: Make sense of problems and persevere in solving them. A-REI.B Solve equations and inequalities in one variable A-REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

	High School: Modeling [1]*Torque/Lever Activity* MP1: Make sense of problems and persevere in solving them. MP4: Model with mathematics. MP5: Use appropriate tools strategically. MP6: Attend to precision. A-REI.B Solve equations and inequalities in one variable A-REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. High School: Modeling
Lesson 4	*Worksheets: BTU Conversions, Thermal Expansion, Pressure Calculations (see Addendum for Worksheets) and Suction Cup Activity (embedded in PowerPoint)* MP5: Use appropriate tools strategically. MP7: Look for and make use of structure. MP8: Look for and express regularity in repeated reasoning. N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. A.CED.A Create equations that describe numbers or relationships. A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R. A.REI.A Understand solving equations as a process of reasoning and explain the reasoning. A.REI.B Solve equations and inequalities in one variable. A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
Lesson 5	[1]*Gas Law Calculations (Booklet)* MP6: Attend to precision. MP7: Look for and make use of structure. A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R. [1]*Conversions (Booklet)* MP6: Attend to precision. MP7: Look for and make use of structure. N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
Lesson 6	[1]*Student Project: Laser Levels* MP2: Reason abstractly and quantitatively. MP4: Model with mathematics. MP5: Use appropriate tools strategically.

	MP6: Attend to precision. N.Q.A Reason quantitatively and use units to solve problems. G-GMD.B Visualize relationships between two-dimensional and three-dimensional objects. G-MG.A Apply geometric concepts in modeling situations G-MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HA-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 trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts 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. 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 position of particles (objects).

Unit 12: Math for Industry	**Hours: 30-50**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- [1]Online Work: oli.cmu.edu STEM Readiness, Module 8: Triangles
- [1]Lab Project: 'Designing a Footbridge with Trusses'.

Lesson 2:

- [1]Lab Project: 'Building a Footbridge with Trusses'.

Lesson 3:

- [1]Online Work: oli.cmu.edu STEM Readiness, Module 9: Cartesian Plane
- [1]Lab Project: Testing Your Footbridge

Lesson 4:

- [1]18 Tasks
- [1]6 Smarter Balanced Math Lesson Plans

- [1]SBA Math Practice Assessment

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Identify and name an angle.
- Measure an angle using a protractor.
- Classify triangles by their angles as right, obtuse, or equilateral.
- Classify triangles by their sides as equilateral, isosceles, or scalene.
- Use the triangle angle sum theorem to determine the measure of an angle in a triangle.
- Determine the measure of an angle by applying the concept of complementary or supplementary angles.
- Identify corresponding sides and angles in similar triangles.
- Determine corresponding angles and sides of similar triangles, using proportions.
- Apply the Pythagorean Theorem to calculate the length of a side of a right triangle.
- Calculate all angles and sides of a right triangle using trigonometry.
- Visualize relationships between two-dimensional and three-dimensional objects.
- Apply geometric concepts in modeling situations.
- Reason quantitatively and use units to solve problems.
- Describe the layout and identify the quadrants of the Cartesian coordinate system.
- Given the point on a graph, determine the ordered pair.
- Given a point on a graph, recognize whether an ordered pair is an x or y intercept.
- Graph points on the coordinate plane given an ordered pair.
- Visually identify whether the slope of a line is positive, negative, zero or undefined.
- Given the coordinates of two points on a line, determine the slope.
- Given data modeling a situation, interpret its slope.
- Given the coordinate of two points on a line, determine its linear equation.
- Given a linear equation, graph a line on the coordinate plane.
- Calculate the midpoint between two points on a line.
- Calculate the distance between two points.
- Given points on a graph, determine a best fit line.
- Represent a constraint by shading the correct side of the inequality line.
- Understand how combining inequalities affects a solution space.
- Interpret a situation and represent the constraints and variables mathematically.
- Select appropriate mathematical methods to use.
- Explore the effects of systematically varying the constraints.
- Interpret and evaluate generated data and identify the optimum case, checking it for confirmation.
- Communicate mathematical reasoning clearly.
- Find, based on equations, lines that are parallel and perpendicular.
- Identify and use intercepts.

- Understanding how the factored form of the function can identify a graph's roots.
- Understanding how the completed square form of the function can identify a graph's maximum or minimum point.
- Understanding how the standard form of the function can identify a graph's intercept.
- Articulate verbally the relationships between variables arising in everyday context.
- Translate between everyday situations and sketch graphs of relationships between variables.
- Interpret algebraic functions in terms of the contexts in which they arise.
- Reflect on the domains of everyday functions and in particular whether they should be discrete or continuous.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Unit Wide	MP1: Make sense of problems and persevere in solving them. MP2: Reason abstractly and quantitatively. MP3: Construct viable arguments and critique the reasoning of others. MP4: Model with mathematics. MP5: Use appropriate tools strategically. MP6: Attend to precision. MP5: Use appropriate tools strategically. MP7: Look for and make use of structure. MP8: Look for an express regularity in repeated reasoning.
Lesson 1	N-Q.A Reason quantitatively and use units to solve problems. N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

	N-Q.2A. Define appropriate quantities for the purpose of descriptive modeling. A.REI.B Solve equations and inequalities in one variable. A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. G.CO.D Make geometric constructions G.CO.D.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). G.SRT.A Understand similarity in terms of similarity transformations G.SRT.A.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. G.SRT.C Define trigonometric ratios and solve problems involving right triangles. G.SRT.C.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G.GMD.B Visualize relationships between two-dimensional and three-dimensional objects. G.MG.A Apply geometric concepts in modeling situations G.MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Lesson 2	N-Q.A Reason quantitatively and use units to solve problems. G.CO.D Make geometric constructions G.CO.D.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). G.GMD.B Visualize relationships between two-dimensional and three-dimensional objects. G.MG.A Apply geometric concepts in modeling situations G.MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Lesson 3	N-Q.A Reason quantitatively and use units to solve problems. A.REI.B Solve equations and inequalities in one variable. A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. F.IF.B Interpret functions that arise in applications in terms of the context. F.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. F.IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.* F.LE.B Interpret expressions for functions in terms of the situation they model. F.LE.B.5 Interpret the parameters in a linear or exponential function in terms of a context. G.GPE.B Use coordinates to prove simple geometric theorems algebraically G.GPE.B.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. S.ID.B Summarize, represent, and interpret data on two categorical and quantitative variables. S.ID.B.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. S.ID.B.6.a Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

	S.ID.B.6.b Informally assess the fit of a function by plotting and analyzing residuals. S.ID.B.6.c Fit a linear function for a scatter plot that suggests a linear association. Interpret linear models S.ID.C Interpret linear models. S.ID.C.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
Lesson 4	N.RN.A Extend the properties of exponents to rational exponents. N.RN.A.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{\frac{1}{3}}$ to be the cube root of 5 because we want $(5^{\frac{1}{3}})^3$ = $(5^{\frac{1}{3}})^3$to hold, so $(5^{\frac{1}{3}})^3$ must equal 5 . N.RN.A.2 Rewrite expressions involving radicals and rational exponents using properties of exponents. N-RN.B Use properties of rational and irrational numbers A-SSE.A Interpret the structure of expressions. A-SSE.A.2 Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$. A-SSE.B Write expressions in equivalent forms to solve problems. A-SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain A-SSE.B.3.a Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. A-APR.A Perform arithmetic operations on polynomials. A-APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. A.APR.B Understand the relationship between zeros and factors of polynomials. A.APR.B.2 Know and apply the Remainder Theorem: For a polynomial *p*(*x*) and a number *a*, the remainder on division by *x* - *a* is *p*(*a*), so *p*(*a*) = 0 if and only if (*x* - *a*) is a factor of *p*(*x*). A.APR.B.3 Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. A-CED.A Create equations that describe numbers or relationships. A-CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. A.REI.B Solve equations and inequalities in one variable. A.REI.B.4 Solve equations and inequalities in one variable. A.REI.C Solve systems of equations. A.REI.C.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$. A.REI.D Represent and solve equations and inequalities graphically A.REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). *A.REI.D.11 Explain why the *x*-coordinates of the points where the graphs of the equations *y* = *f*(*x*) and *y* = *g*(*x*) intersect are the solutions of the equation *f*(*x*) = *g*(*x*); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where *f*(*x*) and/or *g*(*x*) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. F-IF.C Analyze functions using different representations. F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. F-IF.C.7.a Graph linear and quadratic functions and show intercepts, maxima, and minima.

	F-IF.C.7.c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. F-LE.A Construct and compare linear, quadratic, and exponential models and solve problems. S.IC.B Make inferences and justify conclusions from sample surveys, experiments, and observational studies. S.IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 13: Rigging	**Hours: 30**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Load Characterization Activity Worksheets:
  - [1]Converting Dimensions
  - [1]Practicing Volume and Weight
  - [1]Center of Gravity
- Practice Review/Quiz

Lesson 2:

- Knowledge Assessment Quiz

Lesson 3:

- Knowledge Assessment Quiz
- [1]Activity: Practice lift and movement of a load

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Refer to the ANSI/ASME standards that are observed regarding lifting and moving loads

- List, explain and answer the four questions that must be asked before planning a lift or move.
- Given a set of circumstances, predict whether a proposed load movement would be classified as a critical lift, pre-engineered lift, or ordinary lift.
- State the four major steps in planning a move, including two elements of what to look for in each step.
- Apply elements of an ordinary lift plan to an actual lift.
- Measure and determine the volume of a load.
- Convert measurements expressed in different units into common units.
- Calculate the weight of a load.
- Determine the Center of Gravity(C/G) for a symmetrical load.
- Determine the Center of Gravity (C/G) for an asymmetric load.
- Recall and describe the four major steps in planning a move.
- Recall and list the elements of an ordinary lift plan
- Identify types of rigging, describe their features, and explain uses & inspection criteria.
- Differentiate in detail between three examples of steel rigging and three examples of synthetic rigging
- Select and inspect rigging for an actual load lift and movement
- Distinguish between the various types of cranes, hoists and lifting devices encountered at a worksites
- Conduct a pre-operational crane or hoist inspection.
- Rig a load for lift and movement
- State and describe the last of the four major steps in planning a move.
- Rig a load.
- Perform hand signals to direct the load movement.
- Lift and move a load safely using a hoist, or crane if available.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	

Lesson 1	[1]*Worksheet: Converting Dimensions* MP2: Reason abstractly and quantitatively. MP6: Attend to precision. N-Q.A Reason quantitatively and use units to solve problems. N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. [1]*Worksheet: Practicing Volume and Weight* MP1: Make sense of problems and persevere in solving them. MP6: Attend to precision. N-Q.A Reason quantitatively and use units to solve problems. N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. G.GMD.A Explain volume formulas and use them to solve problems. G.GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. G.GMD.B Visualize relationships between two-dimensional and three-dimensional objects. [1]*Worksheet: Center of Gravity* MP1: Make sense of problems and persevere in solving them. MP2: Reason abstractly and quantitatively. MP4: Model with mathematics. MP6: Attend to precision. N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. G.GMD.B Visualize relationships between two-dimensional and three-dimensional objects.
Lesson 2	MP4: Model with mathematics. G-MG.A Apply geometric concepts in modeling situations. G-MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Lesson 3	MP1: Make sense of problems and persevere in solving them. MP6: Attend to precision. N-Q.A Reason quantitatively and use units to solve problems. G.GMD.A Explain volume formulas and use them to solve problems. G.GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. G-MG.A Apply geometric concepts in modeling situations G-MG.A.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	

Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 14: Hydraulics and Pneumatics	**Hours: 30**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Quiz: A hydraulics quiz is available (Addendum)
- [1]Worksheet 1: Pascal's Law Calculations (Booklet)
- [1]Worksheet 2: More Pascal's Law (Booklet)
- [1]Worksheet 3: More Formulas, More Practice (Booklet)
- Reading and Journaling: How Hydraulic Machines Work by Marshall Brain (Booklet)

Lesson 2:

- Activity: Have students take apart some cheap air compressors to see how they work.
- [1]Activity: What Would It Cost to Set Up a Simple Pneumatic System?
- Lab Activity: Tennis Balls Up in the Air

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Explain the physics guiding hydraulics.
- Calculate problems related to fluid power using Pascal's Law, Force, Work, and Power equations.
- Identify the major historical events (and figures) behind the science of fluids.
- Describe the advantages and disadvantages of fluid power.
- Identify and explain the factors to consider when setting up a hydraulic system.
- Define terminology common to hydraulics.
- List the typical components of a basic hydraulics system.
- Recognize the fluid power components from schematics.
- Learn and practice safe handling procedures of hydraulics.
- Apply the knowledge of hydraulics with a hands-on project.

Aligned Washington State Standards

CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP1: Make sense of problems and persevere in solving them. MP2: Reason abstractly and quantitatively. MP7: Look for and make use of structure. N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. A.CED.A Create equations that describe numbers or relationships. A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*
Lesson 2	MP4: Model with mathematics. N.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. High School Modeling
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	

Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 15: Electrical — Hours: 35

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Practice Review/Quiz

Lesson 2:

- Practice Review/Quiz
- In-class activity: Visualizing a Magnetic Field

Lesson 3:

- Practice Review/Quiz

Lesson 4:

- Knowledge Assessment
- In-class activity: Creating a Basic Bread Board Electrical Circuit
- [1]Math Worksheet
- Student Handout

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Describe the basic structure of the atom.
- Define the term: Electron.
- Define the term: Proton.
- Define the term: Neutron.
- Define the term: Valence Shell.
- Define the term: Negative Ion.
- Explain the characteristics of insulators, semiconductors, and conductors.
- Describe how an atom becomes an ion.
- Explain the process of current flow.
- List the six sources of electricity and explain how they produce electrical pressure.
- List the requirements of an electrical circuit.
- Define voltage and its unit of measurement, then write the letter abbreviation for the unit.
- Define current and its unit of measurement, then write the letter abbreviation for the unit.
- Define resistance and its unit of measurement, then write the letter abbreviation for the unit.
- Define power and its unit of measurement, then write the letter abbreviation for the unit.
- Define conductance and its unit of measurement, then write the letter abbreviation for the unit.
- List the factors that determine resistance of wires, their current carrying capacity, and be able to size them.

- Describe the construction of various types of variable resistors and explain the applications they are used for.
- Describe the operation, terms and symbols of circuit protection devices.
- Identify standardized symbols used in schematic diagrams that represent various electronic components.
- Following a schematic diagram, assemble a simple electric circuit.
- Describe the relationships of current, voltage, and resistance.
- Use Ohm's Law equations to solve for electrical circuit values.
- Describe the importance of observing electrical safety.
- Describe the fundamental concepts of electricity.
- Describe grounding.
- Describe how different current levels affect the human body.
- Describe the ways in which electric shock can be received.
- List the steps that should be followed when treating an individual who receives an electric shock.
- Describe the causes and dangers of burns caused by electricity.
- Describe various practices that should be followed to prevent electrical hazards.
- Describe how certain types of electrical devices are engineered to prevent electrical hazardous conditions from occurring.
- Summarize the laws of magnetic attraction and repulsion.
- List the five characteristics of magnetic flux lines.
- Define magnetomotive force (MMF)
- Define magnetic flux.
- Define reluctance as a phenomenon regarding magnetism.
- Define permeability as a phenomenon regarding magnetism.
- Discuss residual magnetism and retentivity.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	

Lesson 4	MP1: Make sense of problems and persevere in solving them. MP7: Look for and make use of structure. N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. A.CED.A Create equations that describe numbers or relationships. A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R*. A.REI.A Understand solving equations as a process of reasoning and explain the reasoning. A.REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. A.REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. A.REI.B Solve equations and inequalities in one variable. A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 16: Soldering	**Hours: 25**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- [1]Worksheet: Eutectic Functions (Addendum)
- Practice Review Assessment

Lesson 2:

- Practice Review/Quiz
- In-class activity # 1: Hand soldering wires to terminals

Lesson 3:

- Practice Review/Quiz
- In-class activity # 2: Sweating Plumbing Connections

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Define the process of soldering, distinguishing the difference between welding, brazing, and soldering
- Apply safety precautions when soldering
- Identify the base metal, solder and flux involved in a typical soldering task
- Explain the role of capillary action in the soldering process
- Distinguish between soft soldering, hard soldering and brazing, including differences in solder and temperatures required
- Relate typical applications where soldering is used
- List common solder alloys and sequence the ratios of common lead-tin alloy solders
- Explain eutectic solder and the properties that make it unique
- List the various forms of solder available and explain the applications in which each is used
- Identify at least three weights and gauges of commonly available solder wire
- Describe the purpose of flux and specify the differences between resin flux and acid flux
- List the general steps involved in the soldering process
- Describe soldering equipment and choose the best type for the assigned task
- Use the solder code to identify the solder type.
- Remove the wire insulation and Tin wires and components
- Solder the required number of prepared wires to terminations
- Rework discrepant soldered terminations
- Measure and cut a length of copper pipe using a pipe cutter or hacksaw
- Deburr and clean the base metal at the joint
- Apply flux and heat copper piping for soldering
- Solder a joint between two copper pipes according to industry standards
- Clean excess flux from a soldered copper piping joint

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	

CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP1: Make sense of problems and persevere in solving them. MP2: Reason abstractly and quantitatively. N.Q.A Reason quantitatively and use units to solve problems. N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. F.IF.A Understand the concept of a function and use function notation. F.IF.A.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x). F.IF.B Interpret functions that arise in applications in terms of the context. F.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.* F.IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 17: Troubleshooting	Hours: 25

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Practice Review/Quiz
- In-class Activity: Online Research

Lesson 2:

- In-class Activity # 1: Troubleshooting Faulty Flashlights (Addendum)
- [1]In-class Activity # 2: Statistical Process Control (Math Activity in Addendum))
- Knowledge Assessment Quiz (Addendum)

Lesson 3

- [1]PowerPoint Activity: Reading Graphs
- Practice Review/Quiz

Lesson 4

- In-class Activity: Troubleshooting Leaf Blowers

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- State the seven phases in logical troubleshooting in the proper sequence.
- Define in their own words each phase of the seven-phase troubleshooting process.
- State the advantages of using this logical troubleshooting process.
- Explain how to distinguish between intermittent symptoms and reproducible symptoms.
- Differentiate between symptom recognition and symptom elaboration.
- Evaluate the advantages of keeping a troubleshooting log.
- Describe the types of information that are normally recorded in a troubleshooting log.
- Articulate the questions that need to be asked during the troubleshooting tech's face-to-face interview with the operator.
- Describe the correct way to record operator speculation about the root cause problem.
- Distinguish between electrical schematics and wiring diagrams.
- Relate how a troubleshooter "brackets" or "traps" the problem by conducting a series of tests to progressively pin down the root cause within the smallest possible function, sub-assembly, area, circuit or component.
- Order the tests and checks logically, once the probable faulty functions have been listed.
- Specify the questions that must be answered to confirm that the problem and associated symptoms have been corrected.
- Recommend actions to prevent future problems.
- Research, design, create and prepare informal documents suitable for the workplace.
- Interact collaboratively with other students to complete the activity assignment.
- Design a usable, clear, accessible document to capture relevant information needed to reconstruct the troubleshooting process
- Evaluate their documents to be sure that the documents fulfill their purpose and to ensure that they can be revised if necessary.
- Evaluate a case study and identify the proper sequence of the seven phases in logical troubleshooting.
- Sequence and undertake each phase of the seven-phase troubleshooting process while conducting a hands-on troubleshooting activity.

- Record data, actions, assumptions, findings, tests, and results in a troubleshooting log.
- Predict a root cause based upon symptoms.
- Evaluate observations to determine the actual root cause of a faulty symptom.
- Interact collaboratively with other students to complete the activity assignment.
- Define the concept of Root Cause Analysis.
- List the steps for performing Root Cause Analysis .
- Explain what is meant in Root Cause Analysis by the term “defining the problem.”
- Describe ways that evidence and data are gathered for analysis.
- Summarize the various basic tools and methods available for performing root cause analysis .
- Compare and explain examples of the “Five Whys” technique.
- Apply the “Five Whys” technique to determine the root cause of a problem.
- Draw a blank example of a Fishbone/Ishikawa diagram .
- Explain how a Fishbone diagram allows troubleshooters to determine root causes and contributing factors that create a fault or symptom.
- [1]Identify a Pareto chart and indicate the root causes displayed that have the biggest negative impact on quality or the manufacturing process.
- Recognize features of the Six Sigma approach and explain the acronym DAMAIC.
- Sequence and undertake each phase of the seven-phase troubleshooting process while conducting a hands-on troubleshooting activity on a multisystem machine (leaf blower).
- Record data, actions, assumptions, findings, tests, and results in a troubleshooting log.
- Predict a root cause based upon symptoms.
- Evaluate observations to determine the actual root cause of a faulty symptom.
- Determine corrective action to eliminate the root cause of the symptom.
- Interact collaboratively with other students to complete the activity assignment.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge

CCSS Math	
Lesson 2	MP1: Make sense of problems and persevere in solving them. MP2: Reason abstractly and quantitatively. MP3: Construct viable arguments and critique the reasoning of others. S.ID.A Summarize, represent, and interpret data on a single count or measurement variable S.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots). S.ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. S.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
Lesson 3	MP2: Reason abstractly and quantitatively. S-IC.B Making inference and justifying conclusions. S-IC.B.3 Make inferences and justify conclusions from sample surveys, experiments, and observational studies: Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 18: Lean/Manufacturing Processes and Principles	**Hours: 35**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Article and Questions: ‘Castings vs. Foundry: What’s the Difference?’ by Brad Done
- [1]Designing and Making Whistles
- [1]Worksheet: Modeling Production

Lesson 2:

- Reading: 'Waste' in Student Booklet, answer questions that follow.
- Reading: 'The Value of Time' in Student Booklet, answer questions that follow.
- Reading: 'Team Evolution' in Student Booklet, answer questions that follow.
- Marshmallow Game
- Four Cup Activity.
- [1]5S Game
- [1]Lean Gummy Bears in Space
- Bottleneck Activity
- Quiz

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Industry Standards and Competencies

Student will be able to:

- Compare and contrast making vs. manufacturing.
- Describe a brief history of manufacturing.
- Summarize manufacturing processes: Casting and Foundry, Forming and Metalworking, Machining, Joining and Assembly, Rapid Prototyping, Material Specific (plastics and ceramics) and Surface Treatment.
- Select which manufacturing process(es) to use according to the workpiece specifications.
- Classify manufacturing shops by their function(s).
- Explain how time and cost factor into the manufacturing process.
- Design and manufacture a whistle, simulating a job shop.
- Identify how Lean principles help companies compete in a global economy.
- Differentiate between value-added versus non value-added activities.
- Identify the eight wastes of Lean and how those wastes reduce an organization's profits, competitive edge and customer satisfaction.
- Associate Lean tools with their ability to reduce manufacturing defects.
- Compare and contrast traditional push and pull systems.
- Understand how Lean principles allow companies to move toward just-in-time production.
- Define Six Sigma and explain how it complements Lean.
- List each step of the Six Sigma DMAIC methodology.
- Utilize basic data analysis tools.
- Define the Theory of Constraints and how it is used to improve a bottleneck scenario.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	

CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Lesson 1	MP1 Make sense of problems and persevere in solving them. MP2 Model with mathematics Mathematical Modeling N-Q.A: Reason quantitatively and use units to solve problems. N-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems: choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
Lesson 2	MP1 Make sense of problems and persevere in solving them MP4 Model with mathematics Mathematical Modeling F-IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. F-IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

The 21st Century Skills should be taught and assessed throughout the course. This table should be included at the end of this document.

21st Century Skills		
Check those that students will demonstrate in this course:		
LEARNING & INNOVATION **Creativity and Innovation** ☒ Think Creatively ☒ Work Creatively with Others ☒ Implement Innovations **Critical Thinking and Problem Solving** ☒ Reason Effectively ☒ **U**se Systems Thinking ☒ Make Judgments and Decisions ☒ Solve Problems **Communication and Collaboration** ☒ Communicate Clearly ☒ Collaborate with Others	**INFORMATION, MEDIA & TECHNOLOGY SKILLS** **Information Literacy** ☒ Access and /evaluate Information ☒ Use and Manage Information **Media Literacy** ☐ Analyze Media ☐ Create Media Products **Information, Communications and Technology (ICT Literacy)** ☐ Apply Technology Effectively	**LIFE & CAREER SKILLS** **Flexibility and Adaptability** ☒ Adapt to Change ☒ Be Flexible **Initiative and Self-Direction** ☒ Manage Goals and Time ☒ Work Independently ☒ Be Self-Directed Learners **Social and Cross-Cultural** ☒ Interact Effectively with Others ☒ Work Effectively in Diverse Teams **Productivity and Accountability** ☒ Manage Projects ☒ Produce Results **Leadership and Responsibility** ☒ Guide and Lead Others ☒ Be Responsible to Others

YEAR 1 MATERIAL COMPLETE.

Statewide Framework Document for: 150613

Standards may be added to this document prior to submission, but may not be removed from the framework to meet state credit equivalency requirements. The equivalency material is either embedded organically into the curriculum or called out through worksheets, activities, projects and standard assessments. Credit equivalency options are designed for Skills Centers (540 hours) or a two year or block period high schools (360 hours). 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 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.

Core Template		
Course:		**Total Framework Hours up to: 540**
CIP Code: 150613	☐ **Exploratory** ☒ **Preparatory**	**Date Last Modified: 01/28/2016**
Career Cluster: Manufacturing		**Cluster Pathway: Manufacturing Production Process Development**
Resources Used: Aerospace Joint Apprenticeship Committee (AJAC), American Society of Metals (ASM), Boeing, Federal Aviation Association (FAA), National STEM Consortium (NSC), Non-Destructive Resource Center (NDT), and other industry-accepted knowledge, skills and abilities (KSA).		

Unit 1: Materials Science	**Hours: 140**

Performance Assessments:
Assessments will be formal and informal, written, verbal and practical:

Lesson 1:

- Handout: Scope and Sequence for Classifying Matter
- Activity: General Comparison of Properties: Metals, Ceramics, Polymers Overhead
- Introductory Activity – Oobleck
- Activity: The Stuff of History
- Lab: A Physical Challenge Lab – Can elements be classified by physical properties?
- Lab: White Powder
- Lab: Materials ID

- Overheads/handouts: Classification of Materials
- Overheads/handouts: Types of Bonding
- Overheads/handouts: Types of Properties
- Handout: Materials ID Descriptions
- Student Booklet: Reading, Writing, and Activities

Lesson 2:

- Lab: Sulfur
- Lab: Rhombic Sulfur
- Lab: Amorphous Sulfur
- Activity 1: Copper Sulfate Demonstration (Growing single crystals)
- Activity 2: Phenyl Salicylate Demonstration
- Lab: Growing Silver Crystals
- Lab: Models of Crystals
- Activity: Iron Wire Demo
- Activity 3: Copper Wire Demonstration
- Lab: Heat – Treating Steel
- Lab: Heat Treating Iron
- Activity: Journaling
- Extra Activities: MAST Module Metals – Experiment 3 Processing Metals and Experiment 4 Tensile Strength Test for Various Metals
- Student Booklet: Reading, Writing, and Activities

Lesson 3:

- Lab: Metal Stations
    - Cost of a Penny
    - Brassing a Penny
    - Penny and Electricity (Rolling of a Penny)
- Lab: Reactivity of Metals
- Lab: Fruit Juice
- Lab: NACE Kit Labs
- Activity: Compression Ignition Demonstration
- Activity: Demonstration – Aluminum and HCl
- Activity: Aluminum Coating and Protection
- Student Booklet: Reading, Writing, and Activities

Lesson 4:

Module 1: Chemistry for Composites

Note: There are multiple activities and labs to choose from. Select which ones are appropriate for your class and where you have the equipment and supplies.

Addendum includes:

- Activity 1: Nylon Polymerization
- Activity 2: Match the Fabric to the Label
- Activity 3: Weaves

- Activity 4: Cardboard Laminate
- Lab: Honeycomb Panel
- Lab: Fiberglass Hand Layup
- Lab: Composite Panel Repair
- Lab: Foam Core Composites
- Lab: Wet Lay-Up
- Lab: Wet Lay-Up with Foam Core
- Lab: Wet Lay-Up in Mold
- Lab: Vacuum Bagging Wet Lay-Up
- Lab: Resin Infusion
- Lab: Vacuum Bagging PrePreg
- Lab: Vacuum Bagging PrePreg with Foam Core
- Lab: Vacuum Bagging PrePreg with Honeycomb
- Lab: Isotropic Panel (Clipboard), 2-Day Minimum

Module 2: Structure and Repair I

- Student Quiz

Module 3: Structure and Repair II

- Student Quiz

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects (individual and group), activities, and class discussions.

Standards and Competencies

Student will be able to:

- Explain the importance of materials sciences.
- Apply basic chemistry to explain physical and chemical characteristics of the four categories of materials.
- Apply knowledge of materials science to explain materials choices in design.
- Use critical thinking to evaluate and apply appropriate materials choice for specific applications.
- Demonstrate practical reasoning, and hands-on/minds-on, problem-solving skills in designing, fabricating, and constructing projects during the course.
- Use writing to record observations, procedures, and experiments and as a tool for thinking, studying, and learning the subject matter.
- Define materials science and how it has changed through history.
- Classify matter.
- Summarize the spatial relationships found on the Periodic Table of Elements.
- Define types of structure, crystalline vs. amorphous.
- Define types of bonding.
- Identify types of properties.
- Relate properties to types of bonding.
- Describe through writing and discussion the basic properties of materials: mechanical, thermal, chemical, optical, and magnetic.
- Characterize materials on the basis of chemical bonding and crystal structure.
- Distinguish between crystal structure and crystal system.
- Describe the relationship between atomic radius and lattice parameter.
- Compare and contrast crystalline and amorphous structures.
- Provide examples of materials that change among amorphous and crystalline states.

- Describe the effect of crystal defects and imperfections in material properties.
- List several common materials used in the design and construction of structures.
- Define simple properties of materials, such as strength, flexibility, transparency.
- Select suitable materials for making a particular object based on their properties.
- Explain the advantages and disadvantages of common materials used in engineering structures.
- Distinguish between chemical and physical properties of a material.
- Differentiate between oxidation and reduction especially as they pertain to galvanic corrosion.
- Define thermal expansion.
- Evaluate the effects of thermal expansion on design considerations.
- Describe the response to force or stress using the terms: workability (malleability and ductility), brittleness, hardness, elasticity and plasticity, toughness and strength.
- Define mechanical properties: tensile strength, compression, fatigue, flexure, impact, torsion, hardness, and shear.
- Relate the physical characteristics of materials such as workability and brittleness to the mechanical properties such as tensile and compressive strength to impact design considerations.
- Describe composite materials.
- Explain the use of ancillary materials.
- Demonstrate basic fabrication techniques.
- Define fiber-reinforced composites.
- Discuss properties of composites.
- Recognize products made from fiber-reinforced composites.
- Explain the differences between polymers and composites.
- Explain the key differences between composites properties and metal properties.
- Calculate resin-fiber ratio.
- Fabricate a fiber reinforced composite part.
- Demonstrate safe fabrication practices.
- Define and prevent resin migration and materials contamination.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts Informational Technology: *Writing*	
CCSS English/Language Arts Informational Technology: *Speaking & Listening*	
CCSS English/Language Arts Informational Technology: *Language*	

Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge.
CCSS Math	
Health and Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-PS1-1 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. 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-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-ETS1-2 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 trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts

Unit 2: Shop Tools	**Hours: 20**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical:

Lesson 1:

- Hand Tools ID Activity

Lesson 2:

- Class Discussion

Lesson 3:

- Power Shop Equipment Test

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

- Articulate tool use hazards and main causes for hand tool mishaps.
- List the workplace tasks that require hand tools to accomplish.
- Describe and select the appropriate hand tool to accomplish a particular workplace task.
- Distinguish between tools that are similar in appearance, stating the commonly used terms for each tool and normal routine application.
- Explain basic techniques and proper use of hand tools.
- Identify and use equipment and tools for manufacturing.
- Use portable power hand tools, including pistol grip drill motor, rivet gun, ratchet wrench, Microstop Countersink Cage, Lockbolt Puller, and Hi-Lok Ratchet Wrench, Nut Runner and Torque Wrench appropriately and safely.
- Interpret a drawing to lay out a job, including the placement of holes, and selection of appropriate tools and fasteners to perform the job.
- Use gages appropriately.
- Install Lockwire.
- Complete the job, per drawing specifications, in accord with the Instructor's performance criteria.
- Articulate general safety hazards associated with the operation of installed power shop equipment.
- List workplace tasks or functions that require power shop equipment to accomplish.
- Describe and select the appropriate power equipment to accomplish a particular workplace function.

- Explain the potential hazards of each individual power shop machine.
- List and point to the safety controls used for each power shop machine and items to inspect prior to use.
- Specify the features and major components of each shop machine in this Unit.
- Explain basic techniques and proper use of common power shop equipment and machinery, including the drill press, disk sander, belt sander, pedestal grinder, band saw, and the manual foot shear.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 3: Safety	Hours: 20

COMPONENTS AND ASSESSMENTS

Performance Assessments:

Assessments will be formal and informal, written, verbal and practical:

Lesson 1:

- Math Worksheet: Interpreting Occupational Injury and Illness Data
- Test

Lesson 2:

- Tombstone Project

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

- Student will be able to describe EHS programs
- Student will be able to practice HazCom
- Student will be able to practice Erognomics
- Student will be able to describe regulations
- Student will be able to model Human Factors
- Student will be able to practice SOP
- Student will be able to demonstrate and use PPE
- Student will be able to identify lockout/tagout
- Student will be able to practice hand powertool safety
- Student will be able to practice industrial housekeeping
- Student will be able to practice environmental safety
- Demonstrate safe practices, including choice of proper PPE, in the use of hand tools such as punch, files, deburring tools, shear, and brake.
- Demonstrate safe practices, including choice of proper PPE, in the use of hand held power tools such as drills.
- Demonstrate safe practices in the use of floor-mounted horizontal band saw and drill press.
- Locate, select, and interpret Material Safety Data Sheets (MSDS) for various materials called out in a project.
- Explain SOPs of the school laboratory.
- Evaluate a situation and design a safety alternative accounting for a range of constraints.
- Appropriately document the use of materials and manufacture of a project consistent with institution policy Quality Management System (QMS).

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
	Integration of Knowledge and Ideas

	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
CCSS English/Language Arts Informational Technology: *Writing*	
CCSS English/Language Arts Informational Technology: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 4: Standard Operating Procedures	**Hours: 20**
COMPONENTS AND ASSESSMENTS	

Performance Assessments:
Assessments will be formal and informal, written, verbal and practical:
Lesson 1:

- Math Worksheet: Late to Work
- Student Booklet: Readings, Questions, Assignments and Activities

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Standard/Unit:

- Define QMS.
- Describe the "enterprise level" of QMS.
- Explain the hierarchy of a manufacturing production order.
- Identify and document a standardized process in their environment.
- Demonstrate knowledge of SOP.
- Evaluate and design revisions required for increase/effective the enterprise QMS.
- Define Root Cause Analysis in fundamental terms.

Aligned Washington State Standards

CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts Informational Technology: *Writing*	
CCSS English/Language Arts Informational Technology: *Speaking & Listening*	
CCSS English/Language Arts Informational Technology: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Social Studies	

Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 5: Precision Measurement	**Hours: 20**
COMPONENTS AND ASSESSMENTS	

Performance Assessment(s):
Assessments will be formal and informal, written, verbal and practical:
Lesson 1:

- Math Worksheet: Solving for Radical Solutions
- Student Booklet: Semi-Precision Measurement:
  - Using a Scale
  - Reading a Scale

Lesson 2:

- Student Booklet: Geometric Dimensioning & Tolerancing

Lesson 3

- Worksheets 1 and 2: Reading a Micrometer
- Lab Activity: Practicing Precision Measurement
- Exam: Measurement covers Lessons 1, 2, and 3
- Student Booklet: Precision Measurement
  - 6-Inch Dial Calipers
  - Micrometers
  - Ball Gages

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:

- Define Semi-Precision Measurement and identify units used.
- Explain the care and handling procedures of semi-precision measurement tools.
- Read a 1/64th English Rule (machinist's scale).

- Identify the Geometric Dimensioning and Tolerancing (GD&T) symbols that represent specific tolerances.
- Read a Feature Control Frame
- Define Precision Measurement and units used.
- Explain care and handling procedures of Precision Measurement tools, and the need and procedure for calibration.
- Identify the parts and read a caliper (Vernier and/or dial).
- Identify the parts, and read an outside Micrometer.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Social Studies	
Art	
Science	

Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 6: Fasteners	**Hours: 10**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical:

Lesson 1

- Worksheet - Thread Measurement: Three Wire Method
- Practice Review Quiz
- Nut & Bolt Installation Activity

Lesson 2

- Practice Review Quiz
- Permanent Fastener Installation Activity

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:

- Identify the components of a fastening system using nuts & bolts
- Indicate and describe the standard features of bolts and nuts
- Specify the materials from which bolts & nuts are made
- Identify protruding bolt head style
- Summarize the use of lubricants and locking devices with nuts & bolts
- Distinguish between sheer and tension as types of stress/load on installed bolts
- List the four forces acting on installed bolts
- Explain the significance of measuring KSI Tensile strength and KSI Shear Strength
- Use a Grip Scale to verify bolt length
- Measure interior diameter of a drilled hole using a hole gage and micrometer
- Demonstrate the normal installation of bolts
- Categorize torque wrench types
- Properly operate a torque wrench
- Identify the components of a fastening system using hex-drive fasteners and lockbolts.
- Indicate and describe the standard features of hex-drive fasteners and lockbolts.
- Distinguish between Hi-Lite and Hi-Lok fasteners and explain the different uses for which they may installed.
- Using a power drill motor, socket and hex drive wrench, demonstrate the normal installation of hex-drive fasteners such as Hi-Lites and Hi-Loks.
- Distinguish protruding head from flush head fasteners.
- Explain the limitations and normal use of washers when installing fasteners on aircraft.

- Summarize inspection checks done after fastener installation.
- Demonstrate the proper removal of hex drive fasteners.
- Point out features of lockbolts, explaining how they are used to securely fasten parts or sheets of material together.
- State the safety considerations when using a lockbolt puller.
- Describe or demonstrate normal procedures for installation of lockbolt fasteners.
- Distinguish lockbolt installations that are acceptable from those that are unacceptable.

Aligned Washington State Standards	
CCSS English/Language Arts: Reading	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 7: Drilling	Hours: 10

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Worksheet: Keep Batch or Not? Standard Deviation
- Practice Review Quiz

Lesson 2:

- Practice Review Quiz
- Practical Drilling Activity

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:

- Identify the characteristics of a properly drilled hole in aluminum in accordance with specifications and industry standards.
- State the importance of creating quality holes in aluminum structure.
- State the qualities of a properly drilled and accurate hole.
- Identify proper drilling equipment (Size, Type and Speed) required for drilling.
- Convert available fractional drill sizes to the required decimal equivalent drill bit needed, using the decimal equivalency card.
- Correctly select the drill guide for the drill bit being used.
- Define and explain the function to the component parts of a counter sink.
- Identify countersink cutters.
- Set a stop countersink for a specific fastener hole location.
- Identify the correct deburring / chamfering tool.
- Provide definition and function to the acceptable and preferred deburring tools.
- Define fastener relief requirements.
- Identify proper drilling equipment (Size, Type and Speed) required for drilling.
- Convert available fractional drill sizes to the required decimal equivalent drill bit needed for a task, using the decimal equivalency card to convert.
- Correctly select the appropriate drill guide for the drill bit being used.
- Set-up a stop countersink for a specific fastener hole location.
- Select and apply the correct deburring / chamfering tool.
- Identify and wear Personal Protection Equipment (PPE) and safe drilling apparel.
- Demonstrate proper drill motor ergonomics while drilling fastener holes in aluminum structures.
- Drill holes in Aluminum that meet quality requirements.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 8: Cutting & Grinding	**Hours: 20**
Performance Assessment(s): Assessments will be formal and informal, written, verbal and practical. Lesson 1:	

- Lab Project: Making a Star

Lesson 2:

- Lab Project: Square Up a Block, Including Tramming
- Booklet includes:
  - Worksheet: Calculating the RPM for Milling Machines
  - Worksheet: Feed Rate
  - Worksheet: Identify Parts of Milling Machine
  - Notes and Worksheet: Cartesian Plane Practice

Lesson 3:

- Lab Project: Lathe Component

Lesson 4:

- Cutting & Grinding Quiz
- Lab Project: Surface Grinding Project

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:

- Adhere to machine shop safety guidelines.
- Demonstrate knowledge of sawing vocabulary.
- Select the appropriate cutting tool.
- Compare and contrast horizontal and vertical band saws.
- Demonstrate safety guidelines specific to horizontal and vertical band saws.
- Apply their knowledge of band saws with a hands-on project.
- Understand the primary uses and benefits of a milling machine.
- Calculate the RPM and Feed Rate of a milling machine.
- Draw and model plotting on the Cartesian 2-D and 3-D planes.
- Critically examine the factors to consider before using a milling machine.
- Demonstrate knowledge of the safety SOP's of a milling machine.
- List the parts of a milling machine.
- Build a project using a milling machine.
- Describe the features of an engine lathe.
- Identify the primary uses of a lathe.
- Describe a lathe's operating procedure.
- Demonstrate knowledge of the safety SOP's of a lathe.
- Use appropriate tooling to produce the project part.
- Explain the primary uses of a surface grinder.
- Demonstrate knowledge on how surface grinders work.
- Exhibit awareness of how to select the appropriate grinding wheel for a workpiece.
- Describe the SOP's of a surface grinder.

- Apply their knowledge of a surface grinder machine by grinding a part (assuming a surface grinder is available).

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 9: Riveting	**Hours: 10**

Performance Assessment(s):
Assessments will be formal and informal, written, verbal and practical.
Lesson 1:

- Practice Review

Lesson 2:

- Riveting Installation Activity
- Riveting Project Questions
- Worksheet: Rivets – What's the Chance?

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:

- Understand basic rivet gun usage and rivet die selection.
- Identify and describe the features of solid shank rivets.
- Distinguish between the two most common types of rivet heads.
- Demonstrate how rivet length is measured with a grip gage.
- Apply knowledge to select and use the appropriate bucking bar for a particular rivet installation.
- Specify the rivet removal process and when it might be required.
- Explain how to rivet parts together permanently using a rivet gun and bucking bar.
- Classify rivet installations as acceptable or unacceptable according to industry standards.
- Measure and lay-up a sheet metal project.
- Drill holes at correct points.
- Operate an automatic hole punch.
- Operate a Throatless shear.
- Operate a box brake to bend sheet metal.
- Assemble parts using Cleco fasteners.
- Rivet parts together permanently using a rivet gun and bucking bar.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	

Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 10: Print Reading	**Hours: 30**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- PowerPoint Activities
- Activities: Identifying Lines and Interpreting Drawings

Lesson 2:

- PowerPoint Activities
- Activity: Orthographic View Drawing Worksheet #1: Drawing a Book
- Activities: Creating Cutouts, Isometric and Orthographic Drawings of Cut-Outs, More Orthographic Drawings
- Activity: Identifying Sectional Views Worksheet
- Activity: Practice Review on Views
- Activity: Lines and Symbols Worksheet

Lesson 3:

- Unit Project: Constructing and Drawing a Sliced Cube within Tolerance

- Group Activity: Guessing Production Tolerance

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:

- Understand fundamental terminology related to prints and drawings.
- Recognize drawing categories.
- Apply drawing authorities.
- Recognize and interpret the elements found on a picture sheet.
- Locate the Title Block on a drawing and identify the name, purpose of a drawing, and other fields depicted.
- Interpret geometric elements in a drawing.
- Identify the Alphabet of Lines.
- Interpret and construct isometric views.
- Interpret and construct an orthographic view.
- Identify types of views, including detail views, sectional views, auxiliary views, and be able to interpret cutting lines.
- Interpret common drawing symbols used in industry.
- Identify types of dimensioning: linear, progressive, typical, equally spaced, angles, arcs, cylinders, holes, size, location, baseline, and tabular.
- Explain the purpose of tolerances.
- Calculate decimal and fraction tolerances.
- Identify classes of fits.
- Construct a model within tolerance, given a drawing.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior.

	2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 11: Applied Physics — Hours: 30

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Worksheets 1 and 2: Mass/Weight/Gravity and Density/Mass/Volume Calculations
- Lab: Which is More Dense?
- Quiz

Lesson 2:

- Worksheet: Vectors
- Quiz

Lesson 3:

- Mechanical Advantage Try These (PowerPoint)
- Torque/Lever Activity (Addendum)
- Simple and Complex Machines Lab Activity (Addendum)
- Paper Airplane Contest (PowerPoint)

Lesson 4:

- Dust-Off Activity: Measuring Temperature (embedded in PowerPoint)
- Worksheet: Converting BTU to ft-lb and vice versa (found in Addendum)

- Worksheet: Calculate Thermal Expansion (found in Addendum)
- Psi Activity (embedded in PowerPoint)
- Worksheet: Calculate Pressure (found in Addendum)
- Suction Cup Activity (embedded in PowerPoint)

Lesson 5:

- Worksheet: Gas Law Calculations (found in Booklet)
- Buoyancy Force 'Try These' (embedded in PowerPoint)
- Buoyancy Force Activity (found in Booklet)
- Worksheet: Physics Conversions (found in Booklet)

Lesson 6:

- Laser Article and Question (found in Booklet)
- Laser Level Activity (found in Booklet)
- Final Physics Exam (found in Addendum)

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:

- Define physics.
- Explain the relationship between matter and mass, and name the three states of matter.
- Define weight and gravity, and how weight relates to mass.
- Solve for weight, mass and gravity using the given formula(s) and using appropriate units.
- Define density and solve for density, mass, volume using the given formula(s) and using appropriate units.
- Define Specific Gravity, and calculate a Specific Gravity ratio given density or weight of an object.
- Define energy, and name the two types of energy in objects.
- Define force, work and power.
- Apply the appropriate English and Metric units to force, work and power.
- Describe the force of friction.
- Apply torque and identify its units.
- Convert between Horsepower and watts.
- Define machines and identify simple machines.
- Distinguish between different types of levers and inclined planes.
- Define mechanical advantage and calculate it using force/distance variables.
- Solve for mechanical work using effort and resistance variables.
- Define stress and its effects; define motion.
- Distinguish between speed and velocity; explain how they are related to acceleration.
- Define heat, its relation to kinetic energy, and its units in both English and Metric.
- List and describe forms of energy which can be converted to heat.
- Explain how heat is transferred and list three methods of heat transfer.
- Define Thermal Efficiency.
- Define Specific Heat and solve for Thermal Expansion.

- Define pressure, list different pressure gauges, and practice solving for psi.
- Define gas laws, and use them to solve for pressure, temperature or volume.
- Identify the various components of air.
- Explain wave phenomena.
- Define wave vocabulary, including units.
- Identify the classifications of waves.
- Explain the electromagnetic spectrum in terms of why some waves are visible and others are not visible by the naked eye.
- Learn how light waves are used in industry.
- Summarize how lasers work and their uses in industry.
- Paraphrase specific safety guidelines when working with lasers.
- Explain how density is dependent on temperature and pressure.
- Define buoyancy and determine if something will sink or float using the buoyancy formula.
- Calculate conversion problems.
- Explain wave phenomena.
- Define wave vocabulary, including units.
- Identify the classifications of waves.
- Explain the electromagnetic spectrum in terms of why some waves are visible and others are not visible by the naked eye.
- Learn how light waves are used in industry.
- Summarize how lasers work and their uses in industry.
- Paraphrase safety guidelines when working with lasers.
- Construct a measurement tool using lasers.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	

Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HA-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 trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts 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. 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 position of particles (objects).

Unit 12: Math for Industry	**Hours: 30**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Online Work: oli.cmu.edu STEM Readiness, Module 8: Triangles
- Lab Project: 'Designing a Footbridge with Trusses'.

Lesson 2:

- Lab Project: 'Building a Footbridge with Trusses'.

Lesson 3:

- Online Work: oli.cmu.edu STEM Readiness, Module 9: Cartesian Plane
- Lab Project: Testing Your Footbridge

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:

- Identify and name an angle.
- Measure an angle using a protractor.
- Classify triangles by their angles as right, obtuse, or equilateral.
- Classify triangles by their sides as equilateral, isosceles, or scalene.
- Use the triangle angle sum theorem to determine the measure of an angle in a triangle.
- Determine the measure of an angle by applying the concept of complementary or supplementary angles.
- Identify corresponding sides and angles in similar triangles.
- Determine corresponding angles and sides of similar triangles, using proportions.
- Apply the Pythagorean Theorem to calculate the length of a side of a right triangle.
- Calculate all angles and sides of a right triangle using trigonometry.
- Visualize relationships between two-dimensional and three-dimensional objects.
- Apply geometric concepts in modeling situations.
- Reason quantitatively and use units to solve problems.
- Describe the layout and identify the quadrants of the Cartesian coordinate system.
- Given the point on a graph, determine the ordered pair.
- Given a point on a graph, recognize whether an ordered pair is an x or y intercept.
- Graph points on the coordinate plane given an ordered pair.
- Visually identify whether the slope of a line is positive, negative, zero or undefined.
- Given the coordinates of two points on a line, determine the slope.
- Given data modeling a situation, interpret its slope.
- Given the coordinate of two points on a line, determine its linear equation.
- Given a linear equation, graph a line on the coordinate plane.
- Calculate the midpoint between two points on a line.
- Calculate the distance between two points.
- Given points on a graph, determine a best fit line.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	

CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 13: Rigging	**Hours: 30**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Load Characterization Activity Worksheets:
  - Converting Dimensions
  - Practicing Volume and Weight
  - Center of Gravity
- Practice Review/Quiz

Lesson 2:

- Knowledge Assessment Quiz

Lesson 3:

- Knowledge Assessment Quiz
- Activity: Practice lift and movement of a load

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:

- Refer to the ANSI/ASME standards that are observed regarding lifting and moving loads
- List, explain and answer the four questions that must be asked before planning a lift or move.
- Given a set of circumstances, predict whether a proposed load movement would be classified as a critical lift, pre-engineered lift, or ordinary lift.
- State the four major steps in planning a move, including two elements of what to look for in each step.
- Apply elements of an ordinary lift plan to an actual lift.
- Measure and determine the volume of a load.
- Convert measurements expressed in different units into common units.
- Calculate the weight of a load.
- Determine the Center of Gravity(C/G) for a symmetrical load.
- Determine the Center of Gravity (C/G) for an asymmetric load.
- Recall and describe the four major steps in planning a move.
- Recall and list the elements of an ordinary lift plan
- Identify types of rigging, describe their features, and explain uses & inspection criteria.
- Differentiate in detail between three examples of steel rigging and three examples of synthetic rigging
- Select and inspect rigging for an actual load lift and movement
- Distinguish between the various types of cranes, hoists and lifting devices encountered at a worksites
- Conduct a pre-operational crane or hoist inspection.
- Rig a load for lift and movement
- State and describe the last of the four major steps in planning a move.
- Rig a load.
- Perform hand signals to direct the load movement.
- Lift and move a load safely using a hoist, or crane if available.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	

Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 14: Hydraulics and Pneumatics	**Hours: 30**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Quiz: A hydraulics quiz is available (Addendum)
- Worksheet 1: Pascal's Law Calculations (Booklet)
- Worksheet 2: More Pascal's Law (Booklet)
- Worksheet 3: More Formulas, More Practice (Booklet)
- Reading and Journaling: How Hydraulic Machines Work by Marshall Brain (Booklet)

Lesson 2:

- Activity: Have students take apart some cheap air compressors to see how they work.
- Activity: What Would It Cost to Set Up a Simple Pneumatic System?
- Lab Activity: Tennis Balls Up in the Air

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:

- Explain the physics guiding hydraulics.
- Calculate problems related to fluid power using Pascal's Law, Force, Work, and Power equations.
- Identify the major historical events (and figures) behind the science of fluids.
- Describe the advantages and disadvantages of fluid power.
- Identify and explain the factors to consider when setting up a hydraulic system.
- Define terminology common to hydraulics.
- List the typical components of a basic hydraulics system.
- Recognize the fluid power components from schematics.
- Learn and practice safe handling procedures of hydraulics.
- Apply the knowledge of hydraulics with a hands-on project.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	

Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 15: Electrical — Hours: 35

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:
- Practice Review/Quiz

Lesson 2:
- Practice Review/Quiz
- In-class activity: Visualizing a Magnetic Field

Lesson 3:
- Practice Review/Quiz

Lesson 4:
- Knowledge Assessment
- In-class activity: Creating a Basic Bread Board Electrical Circuit
- Math Worksheet
- Student Handout

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:
- Describe the basic structure of the atom.
- Define the term: Electron.
- Define the term: Proton.
- Define the term: Neutron.
- Define the term: Valence Shell.

- Define the term: Negative Ion.
- Explain the characteristics of insulators, semiconductors, and conductors.
- Describe how an atom becomes an ion.
- Explain the process of current flow.
- List the six sources of electricity and explain how they produce electrical pressure.
- List the requirements of an electrical circuit.
- Define voltage and its unit of measurement, then write the letter abbreviation for the unit.
- Define current and its unit of measurement, then write the letter abbreviation for the unit.
- Define resistance and its unit of measurement, then write the letter abbreviation for the unit.
- Define power and its unit of measurement, then write the letter abbreviation for the unit.
- Define conductance and its unit of measurement, then write the letter abbreviation for the unit.
- List the factors that determine resistance of wires, their current carrying capacity, and be able to size them.
- Describe the construction of various types of variable resistors and explain the applications they are used for.
- Describe the operation, terms and symbols of circuit protection devices.
- Identify standardized symbols used in schematic diagrams that represent various electronic components.
- Following a schematic diagram, assemble a simple electric circuit.
- Describe the relationships of current, voltage, and resistance.
- Use Ohm's Law equations to solve for electrical circuit values.
- Describe the importance of observing electrical safety.
- Describe the fundamental concepts of electricity.
- Describe grounding.
- Describe how different current levels affect the human body.
- Describe the ways in which electric shock can be received.
- List the steps that should be followed when treating an individual who receives an electric shock.
- Describe the causes and dangers of burns caused by electricity.
- Describe various practices that should be followed to prevent electrical hazards.
- Describe how certain types of electrical devices are engineered to prevent electrical hazardous conditions from occurring.
- Summarize the laws of magnetic attraction and repulsion.
- List the five characteristics of magnetic flux lines.
- Define magnetomotive force (MMF)
- Define magnetic flux.
- Define reluctance as a phenomenon regarding magnetism.
- Define permeability as a phenomenon regarding magnetism.
- Discuss residual magnetism and retentivity.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	

CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 16: Soldering	**Hours: 25**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Worksheet: Eutectic Functions (Addendum)
- Practice Review Assessment

Lesson 2:

- Practice Review/Quiz
- In-class activity # 1: Hand soldering wires to terminals

Lesson 3:

- Practice Review/Quiz
- In-class activity # 2: Sweating Plumbing Connections

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:

- Define the process of soldering, distinguishing the difference between welding, brazing, and soldering
- Apply safety precautions when soldering
- Identify the base metal, solder and flux involved in a typical soldering task
- Explain the role of capillary action in the soldering process
- Distinguish between soft soldering, hard soldering and brazing, including differences in solder and temperatures required
- Relate typical applications where soldering is used
- List common solder alloys and sequence the ratios of common lead-tin alloy solders
- Explain eutectic solder and the properties that make it unique
- List the various forms of solder available and explain the applications in which each is used
- Identify at least three weights and gauges of commonly available solder wire
- Describe the purpose of flux and specify the differences between resin flux and acid flux
- List the general steps involved in the soldering process
- Describe soldering equipment and choose the best type for the assigned task
- Use the solder code to identify the solder type.
- Remove the wire insulation and Tin wires and components
- Solder the required number of prepared wires to terminations
- Rework discrepant soldered terminations
- Measure and cut a length of copper pipe using a pipe cutter or hacksaw
- Deburr and clean the base metal at the joint
- Apply flux and heat copper piping for soldering
- Solder a joint between two copper pipes according to industry standards
- Clean excess flux from a soldered copper piping joint

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	

Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 17: Troubleshooting	**Hours: 25**

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Practice Review/Quiz
- In-class Activity: Online Research

Lesson 2:

- In-class Activity # 1: Troubleshooting Faulty Flashlights (Addendum)
- In-class Activity # 2: Statistical Process Control (Math Activity in Addendum))
- Knowledge Assessment Quiz (Addendum)

Lesson 3

- Practice Review/Quiz

Lesson 4

- In-class Activity: Troubleshooting Leaf Blowers

Leadership Alignment:
Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:

- State the seven phases in logical troubleshooting in the proper sequence.
- Define in their own words each phase of the seven-phase troubleshooting process.
- State the advantages of using this logical troubleshooting process.
- Explain how to distinguish between intermittent symptoms and reproducible symptoms.
- Differentiate between symptom recognition and symptom elaboration.
- Evaluate the advantages of keeping a troubleshooting log.
- Describe the types of information that are normally recorded in a troubleshooting log.
- Articulate the questions that need to be asked during the troubleshooting tech's face-to-face interview with the operator.
- Describe the correct way to record operator speculation about the root cause problem.
- Distinguish between electrical schematics and wiring diagrams.
- Relate how a troubleshooter "brackets" or "traps" the problem by conducting a series of tests to progressively pin down the root cause within the smallest possible function, sub-assembly, area, circuit or component.
- Order the tests and checks logically, once the probable faulty functions have been listed.
- Specify the questions that must be answered to confirm that the problem and associated symptoms have been corrected.
- Recommend actions to prevent future problems.
- Research, design, create and prepare informal documents suitable for the workplace.
- Interact collaboratively with other students to complete the activity assignment.
- Design a usable, clear, accessible document to capture relevant information needed to reconstruct the troubleshooting process
- Evaluate their documents to be sure that the documents fulfill their purpose and to ensure that they can be revised if necessary.
- Evaluate a case study and identify the proper sequence of the seven phases in logical troubleshooting.
- Sequence and undertake each phase of the seven-phase troubleshooting process while conducting a hands-on troubleshooting activity.
- Record data, actions, assumptions, findings, tests, and results in a troubleshooting log.
- Predict a root cause based upon symptoms.
- Evaluate observations to determine the actual root cause of a faulty symptom.
- Interact collaboratively with other students to complete the activity assignment.
- Define the concept of Root Cause Analysis.
- List the steps for performing Root Cause Analysis .
- Explain what is meant in Root Cause Analysis by the term "defining the problem."
- Describe ways that evidence and data are gathered for analysis.
- Summarize the various basic tools and methods available for performing root cause analysis .
- Compare and explain examples of the "Five Whys" technique.
- Apply the "Five Whys" technique to determine the root cause of a problem.
- Draw a blank example of a Fishbone/Ishikawa diagram .
- Explain how a Fishbone diagram allows troubleshooters to determine root causes and contributing factors that create a fault or symptom.
- Identify a Pareto chart and indicate the root causes displayed that have the biggest negative impact on quality or the manufacturing process.
- Recognize features of the Six Sigma approach and explain the acronym DAMAIC.
- Sequence and undertake each phase of the seven-phase troubleshooting process while conducting a hands-on troubleshooting activity on a multisystem machine (leaf

blower).

- Record data, actions, assumptions, findings, tests, and results in a troubleshooting log.
- Predict a root cause based upon symptoms.
- Evaluate observations to determine the actual root cause of a faulty symptom.
- Determine corrective action to eliminate the root cause of the symptom.
- Interact collaboratively with other students to complete the activity assignment.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	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.

Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Unit 18: Lean/Manufacturing Processes and Principles	Hours: 35

Performance Assessment(s):

Assessments will be formal and informal, written, verbal and practical.

Lesson 1:

- Article and Questions: 'Castings vs. Foundry: What's the Difference?' by Brad Done
- Designing and Making Whistles
- Worksheet: Modeling Production

Lesson 2:

- Reading: 'Waste' in Student Booklet, answer questions that follow.
- Reading: 'The Value of Time' in Student Booklet, answer questions that follow.
- Reading: 'Team Evolution' in Student Booklet, answer questions that follow.
- Marshmallow Game
- Four Cup Activity.
- 5S Game
- Lean Gummy Bears in Space
- Bottleneck Activity
- Quiz

Leadership Alignment:

Leadership activities are embedded in curriculum and instruction and is exhibited through student projects, activities, and class discussions.

Standards and Competencies

Student will be able to:

- Compare and contrast making vs. manufacturing.
- Describe a brief history of manufacturing.
- Summarize manufacturing processes: Casting and Foundry, Forming and Metalworking, Machining, Joining and Assembly, Rapid Prototyping, Material Specific (plastics and ceramics) and Surface Treatment.
- Select which manufacturing process(es) to use according to the workpiece specifications.
- Classify manufacturing shops by their function(s).
- Explain how time and cost factor into the manufacturing process.
- Design and manufacture a whistle, simulating a job shop.
- Identify how Lean principles help companies compete in a global economy.
- Differentiate between value-added versus non value-added activities.
- Identify the eight wastes of Lean and how those wastes reduce an organization's profits, competitive edge and customer satisfaction.
- Associate Lean tools with their ability to reduce manufacturing defects.
- Compare and contrast traditional push and pull systems.
- Understand how Lean principles allow companies to move toward just-in-time production.
- Define Six Sigma and explain how it complements Lean.

- List each step of the Six Sigma DMAIC methodology.
- Utilize basic data analysis tools.
- Define the Theory of Constraints and how it is used to improve a bottleneck scenario.

Aligned Washington State Standards	
CCSS English/Language Arts: *Reading*	
CCSS English/Language Arts: *Writing*	
CCSS English/Language Arts: *Speaking & Listening*	
CCSS English/Language Arts: *Language*	
Educational Technology	
Unit Wide	1.2.1 Communicate and collaborate to learn with others. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.4.1 Formulate and synthesize new knowledge
CCSS Math	
Health & Fitness	
Unit Wide	1.1 The student acquires the knowledge and skills necessary to maintain an active life: movement, physical fitness, and nutrition. 1.2.1 Applies how to perform activities and tasks safely and appropriately. 1.4.2 Analyzes components of skill-related fitness as related to careers/occupations/recreation. 3.1.2 Analyzes how environmental factors affect health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Social Studies	
Art	
Science	
Unit Wide	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.
Unit Wide	HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

The 21st Century Skills should be taught and assessed throughout the course. This table should be included at the end of this document.

21st Century Skills		
Check those that students will demonstrate in this course:		
LEARNING & INNOVATION **Creativity and Innovation** ☒ Think Creatively ☒ Work Creatively with Others ☒ Implement Innovations **Critical Thinking and Problem Solving** ☒ Reason Effectively ☒ Use Systems Thinking ☒ Make Judgments and Decisions ☒ Solve Problems **Communication and Collaboration** ☒ Communicate Clearly ☒ Collaborate with Others	**INFORMATION, MEDIA & TECHNOLOGY SKILLS** **Information Literacy** ☒ Access and /evaluate Information ☒ Use and Manage Information **Media Literacy** ☐ Analyze Media ☐ Create Media Products **Information, Communications and Technology (ICT Literacy)** ☐ Apply Technology Effectively	**LIFE & CAREER SKILLS** **Flexibility and Adaptability** ☒ Adapt to Change ☒ Be Flexible **Initiative and Self-Direction** ☒ Manage Goals and Time ☒ Work Independently ☒ Be Self-Directed Learners **Social and Cross-Cultural** ☒ Interact Effectively with Others ☒ Work Effectively in Diverse Teams **Productivity and Accountability** ☒ Manage Projects ☒ Produce Results **Leadership and Responsibility** ☒ Guide and Lead Others ☒ Be Responsible to Others

YEAR 1 MATERIAL COMPLETE.

Statewide Framework Document for: 120505

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

Food Production and Services

Course: Food Production and Service (Up to 4 semester courses in a two year program)	**Total Framework Hours up to: 180 to 360**
CIP Code: 120505 ☐ **Exploratory** ☒ **Preparatory**	**Date Last Modified: 3-10-2016**
Career Cluster: Hospitality & Tourism	**Cluster Pathway: Restaurant, Food, Beverage Services**
Eligible for Equivalent Credit in: ☐ **Math** ☒ **Science**	**Total Number of Units: 15**

Course overview

Summary:

The 8 out of 10 individuals work within the Hospitality industry at some point in their careers. It is one of the largest industries in the United States with many job opportunities from the farm to the table. In Food production and services, students learn the knowledge, skills, and practices required for careers in the hospitality industry from the food service and management side of the business. The course focuses on the relationship between food preparation, consumption, health, and service. Instruction includes Safety and Sanitation, Kitchen Basic, People Skills and Teamwork, Industrial Kitchen Equipment, Culinary Techniques and Skills, Customer Service and Relations, Nutrition and Menu Planning. Science is integrated throughout the course in such experiments as the caramelization of sugars and starches, the production and growth of yeast, or the effects of temperature on chocolate. Students may study such topics as the effects of antioxidants on humans, the shelf life of food products, and the positive and negative effects of bacteria on food.

During this course, students will work in teams to prepare and serve food. They will predict, interpret, and evaluate food service products and presentation for results. Throughout the course, students will discover exciting careers in the food industry. This framework is based on the National Family & Consumer Sciences (FACS) industry standards and is aligned with the Washington State Science Standards.

Resources for this course include:

- Principles of Food Science textbook (requested new text for 2014)
- Washington State Department of Health (www.doh.wa.gov)
- *The 12 Most Unwanted Bacteria* assignment
- *ACF standards*
- *Foundations of Culinary arts and Restaurant Management*
- Family & Consumer Sciences National Standards

Family Career and Community Leaders of America (FCCLA)
Pro-Start

Unit 1 – The Hospitality and Tourism Industry	Total Learning Hours for Unit: 15

Unit 1- Performance Assessments: Students will::

1. Analyze their work experiences and skill level by creating a career portfolio that includes, but is not limited to the following: a personal biography, resume, and job application.
2. Research, then compare and contrast 3 food service jobs in relationship to their own skills development, their plans for a food service career and the lifestyle they want to enjoy.
3. Conduct a real or mock interview elaborating on skills, goals, and decisions made concluding with a summary of their work to date and prediction for the future.
4. Include samples of best recipes and work in a personal portfolio, along with other supportive program accomplishments. The portfolio will include evidence of attainment of FACS Competencies 1.2.1, 1.2.3, 1.2.4, 1.2.5, 1.2.6, and 1.2.8. The portfolio may be presented during culminating project or to achieve final Certificate of Program Completion.

Unit 1 - Leadership Alignment: FCCLA student Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using Parliamentary Procedure; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA). For this unit, students will begin to formulate one or more in or out of school Community Awareness and service outreach projects. Assessments using FCCLA activities include: Career Investigation/ Career Connection, events that focus on this lesson and topics and include activities that use built-in Rubrics.

Standards and Competencies

Standards and Competencies:

Careers: food service and hospitality industry opportunities
8.1.2 Explore opportunities for employment and entrepreneurial endeavors.
8.1.3 Examine education and training requirements and opportunities for career paths in food production and services

1. Explore opportunities for employment and entrepreneurial endeavors.
2. Examine education and training requirements and opportunities for career paths in food production and services.
3. Determine the roles and functions of individuals engaged in food production and services careers.

Aligned to Washington State Standards

Arts	Arts 2.0 The student demonstrates thinking skills using artistic processes. 2.1. Applies a creative process to the arts (dance, music, theatre and visual arts):
Educational Technology	1 Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems. 1.3 Investigate and think critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior. 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning. 2.2.1 Develop skills to use technology effectively. 2.2.2 Use a variety of hardware to support learning.
Health and Fitness	Fitness 4.1 Analyzes personal health and fitness information 4.1.2 Analyzes career opportunities in health and fitness. (compares career opportunities) Health 3.1 Analyzes and evaluates the impact of real-life influences on health. 3.1.2 Analyzes how environmental factors impact health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices. Health 3.3 Evaluates the impact of social skills on health. 3.3.1 Analyze conflict situations (effective communication skills, conflict resolution).
Language	Conventions of Standard English

	1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. (AS.L.1) 4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. (AS.L.4) 6 - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. (AS.L.6)
Math	CC: Mathematical Practices (MP) 1 – Make sense of problems and persevere in solving them. 2 – Reason abstractly and quantitatively. 3 – Construct viable arguments and critique the reasoning of others. 4 – Model with mathematics. 5 – Use appropriate tools strategically. 6 – Attend to precision. 7 – Look for and make use of structure. 8 – Look for and express regularity in repeated reasoning.
Reading	Key Ideas and Details (11- 12) 2 - Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text. Integration of Knowledge and Ideas (11 – 12) 7 - Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. Range of Reading and Level of Text Complexity (11 – 12) 10 - Read and comprehend complex literary and informational texts independently and proficiently.(AS.R.10)
Science	
Social Studies	Economics Economics 2.1 Understands that people have to make choices between wants and needs and evaluate outcomes of those choices. Social Studies Skills 5.2 Uses inquiry based research.
Speaking and Listening	Comprehension and Collaboration (11-12) 1 - Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. Presentation of Knowledge and Ideas (11-12) 4 - Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range or formal and informal tasks.
Writing	Writing for Literacy in History/ Social Studies, Science, and Technical Subjects (9 – 10) (Integrates CCR) Text Types and Purposes CCR 2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. (AS.W.2) 3 - Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. (AS.W.3) Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4)

	5 - Develop and strengthen writing a needed by planning, revising, editing, rewriting or trying a new approach, focusing on what is most significant for a specific purpose and audience. 6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. (AS.W.6) Research to Build and Present Knowledge 7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. (AS.W.7) Range of Writing 10 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences**.** (AS.W.10)

Unit 2 - Safety and Sanitation	**Total Learning Hours for Unit: 15**

Unit 2 - Performance Assessments: Students will:

1. Acquire a food handler's card
2. Acquire ServSafe training
3. Demonstrate basic food safety first aid using role play situations that require assessment of the injury and appropriate treatment.
4. Demonstrate proper food safety and sanitation.

Unit 2 - Leadership Alignment:

FCCLA **s**tudent Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school and service outreach. For this unit, FCCLA activities include: **Culinary Arts,** events that focus on this lesson and built-in Rubrics.

Standards and Competencies

STANDARDS

- Sanitation and food safety
- Establishing a food safety system
- Food handling/food flow
- Accident prevention

Sanitation and food safety

8.2.1 Determine pathogens found in food and their role in causing illness.
8.2.3 Use knowledge of systems for documenting, investigating, and report food borne illness.
8.2.8 Examine current types and proper uses of cleaning materials and sanitizers.
8.2.9 Use Occupational Safety and Health Administration's (OSHA) Right to Know Law and Material Safety Data Sheets (MSDS) and explain their requirements in handling hazardous materials.
8.2.10 Demonstrate waste disposal and recycling methods.
8.2.11 Demonstrate ability to maintain necessary records to document time and temperature control employee health, maintenance of equipment, and other elements of food preparation, storage, and presentation.
9.2.1 Determine factors that contribute to food borne illnesses.
9.2.7 Classify current types of cleaning materials and sanitizers and their proper use.
14.4.5 Monitor food borne illness as a health issue for individuals and families.
14.4.6 Review public dialogue about food safety and sanitation. Establishing a food safety system
5.4.5 Determine procedures for safely handling and storing hazardous materials and waste products.
8.2.2 Employ food service management safety/sanitation program procedures.
8.2.4 Use Hazard Analysis Critical Control Point (HACCP) principles and procedures during food handling processes to minimize the risks of food borne illness.
8.2.7 Demonstrate food handling and preparation techniques that prevent cross contamination between raw and read-to-eat foods and between animal or fish sources and other food products.

Food handling/food flow

8.2.5 Practice good personal hygiene/health procedures, and report symptoms of illness.

2.6 Demonstrate proper receiving and storage of both raw and prepared foods.
8.2.7 Demonstrate food handling and preparation techniques that prevent cross contamination between raw and ready-to-eat foods and between animal or fish sources and other food products.
9.2.6 Demonstrate procedures for receiving and storage of raw and prepared foods

Workplace safety/regulations

1.2.7 Examine factors that contribute to maintaining safe and healthy work and community environments.
5.4.5 Determine procedures for safely handling and storing hazardous materials and waste products.
5.5.3 Demonstrate safe procedures in the use, care, and storage of equipment.
5.5.4 Apply safety and security as required by Occupational Safety and Health Administration (OSHA) and other agencies.
5.5.5 Apply procedures for infection control.
5.5.6 Examine concepts of epidemiology
8.2.9 Use Occupational Safety and Health Administration (OSHA) Right to Know Law and Material Safety Data Sheets (MSDS) and explain their requirements in handling hazardous materials.
8.2.11 Demonstrate ability to maintain necessary records to document time and temperature control, employee health, maintenance of equipment, and other elements of food preparation, storage, and presentation.

Accident prevention

8.5.1 Demonstrate skills in knife, tool, and equipment handling.
8.6.9 Design internal/external disaster plan. First aid: safety management/emergency reporting
1.2 Demonstrate transferable and employability skills in community and workplace.
5.4.4 Record hazardous situations accurately and communicate to appropriate authorities.
5.5.2 Prepare security procedures
5.5.3 Demonstrate safe procedures in use, care, and storage or equipment.
8.2.5 Practice good personal hygiene/health procedure, and report symptoms of illness. B1 Use/follow recognized safety and sanitation practices

Aligned to Washington State Standards

Arts	
Educational Technology	1. Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems. 1.3.2 Locate and organize information and solve problems using digital tools and resources. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2. Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior. 2.2.1 Develop skills to use technology effectively.
Health and Fitness	Health 2.3 Understands the concepts of prevention and control of disease. 2.3.2 Analyzes personal health practices and how they affect non-communicable diseases (heart disease). Health 2.4 Acquires skills to live safely and reduce health risks. Health 3 Analyzes and evaluates the impact of real-life influences on health. 3.1.2 Analyzes how environmental factors impact health. Health 3.2: Evaluates health and fitness information. 3.2.1 Evaluates health and fitness information, products, and services. Health 3.3 Evaluates the impact of social skills on health.
Language	Conventions of Standard English CCR 1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. (AS.L.1) 2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. (AS.L.2) 4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. (AS.L.4) 6 - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or

	phrase important to comprehension or expression. (AS.L.6)
Math	<u>CC: Mathematical Practices (MP)</u> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Reading	<u>CC: Reading Informational Text</u> 3 - Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text. 4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). <u>Integration of Knowledge and Ideas</u> 7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. (AS.R.7) 8 - Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. (AS.R.8) 9 - Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take. (AS.R.9) 10 - Read and comprehend complex literary and informational texts independently and proficiently. (AS.R.10)
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. H. S-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. 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. HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. HS-LS3-1. Ask Questions to Clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

	HS-LS4-5 Evaluate the evidence supporting claims that Changes in environmental conditions may result in (1) increases in the number of individuals of some species (2) the emergence of new species overtime, and (3) the extinction of other species
Social Studies	
Speaking and Listening	Comprehension and Collaboration CCR 1 - Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. 2 - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (AS.SL.2) 3 - Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. Presentation of Knowledge and Ideas 4 - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. (AS.SL.4) 5 - Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations. (AS.SL.5) Presentation of Knowledge and Ideas 6 - Adapt speech to a variety of contexts and communicative tasks, demonstrating command of Formal English when indicated or appropriate. (AS.SL.6)
Writing	Writing for Literacy in History/ Social Studies, Science, and Technical Subjects (9 – 10) (Integrates CCR) Text Types and Purposes 1 - Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. (AS.W.1) 2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. (AS.W.2) Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4) 6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. (AS.W.6) Research to Build and Present Knowledge 7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. (AS.W.7) 8 - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. (AS.W.8) 9 - Draw evidence from literary or informational texts to support analysis, reflection, and research. (AS.W.9\ Range of Writing 10 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. (AS.W.10)

Unit 3- Kitchen/ Culinary Basics	**Total Learning Hours for Unit: 40**

Unit 3 - Performance Assessments:

1 - Having determined the recipe yield needed, the student will standardize (increase or decrease) a recipe, analyze and make recipe ingredient adjustments, and determine modifications in preparation. The student will test the recipe for conversion success.

2 - Having determined the recipe yield needed, the student will convert (increase of decrease) a recipe, analyze and make recipe ingredient adjustments, and determine modifications in preparation. The student will test the recipe for conversion success.

3 - Students will use a competency performance rubric based on industry standards for assessing the proper and efficient use of recognized standard preparation methods.

Unit 3 - Leadership Alignment:

FCCLA **s**tudent Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school community and service outreach. For this unit, FCCLA activities include using the Planning Process to plan labs and events that focus on these lessons.

Standards and Competencies

Standards:

-Use standardized recipes/measurements
-Demonstrate a variety of cooking methods including roasting, baking, broiling, sautéing, frying, deep frying, braising, stewing, poaching, steaming, and other emerging Technologies.
-Apply the fundamental of time and temperature to cooking, cooling, and reheating of a variety of foods.
-Demonstrate appropriate food presentation techniques.
-Demonstrate ability to select, store, prepare, and serve nutritious and aesthetically pleasing foods.
-Using standardized recipes/measurements
8.5.3 Utilize weights and measures to demonstrate proper scaling and measurement techniques.
9.6.4 Create standardized recipes.
9.6.5 Manage amounts of food to meet needs of customers, clients. Getting ready to cook: cooking methods
8.5.2 Demonstrate a variety of cooking methods including roasting and baking, broiling, smoking, grilling, sautéing, frying, deep frying, braising, stewing, poaching, steaming, working, convection, micro waving, and other emerging technologies.
8.5.4 Apply the fundamental of time and temperature to cooking, cooling, and reheating of a variety of foods.
8.5.5 Prepare various meats, seafood, and poultry.
8.5.6 Prepare various stocks, soups, and sauces.
8.5.7 Prepare various fruits, vegetables, starches, and farinaceous items.
8.5.8 Prepare various salads, dressings, marinades, and spices.
8.5.9 Prepare sandwiches, canapés, and appetizers.
8.5.10 Prepare baked goods and desserts.
8.5.11 Prepare breakfast meats, eggs, cereals, and batter products.
8.5.12 Demonstrate food presentation techniques.
8.5.13 Examine the applicability of convenience food items.
14.3.3 Demonstrate ability to select, store, prepare, and serve nutritious and aesthetically pleasing foods.

Aligned to Washington State Standards

Arts	
Educational Technology	1. Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems. 1.3.2 Locate and organize information and solve problems using digital tools and resources. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2. Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior. 2.2.2 Use a variety of hardware to support learning.
Health and Fitness	Health 2.1 Understands dimensions and indicators of health. Health 2.3 Understands the concepts of prevention and control of disease. 2.3.2. Analyzes personal health practices and how they affect non-communicable diseases (heart disease). Health 2.4 Acquires skills to live safely and reduce health risks. Health 3 Analyzes and evaluates the impact of real-life influences on health. 3.1.2 Analyzes how environmental factors impact health. 3.2 Evaluates health and fitness information. 3.3 Evaluates the impact of social skills on health.

	3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices. Health 3.2: Evaluates health and fitness information. 3.2.1 Evaluates health and fitness information, products, and services. Health 4.1 Analyzes personal health and fitness information. 4.1.2 Analyzes career opportunities in health and fitness (compares career opportunities).
Language	Knowledge of Language (9-10) 2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. (AS.L.2) 2c - Spell correctly Vocabulary Acquisition and Use 4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. (AS.L.4) 4c - Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the Pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology. 6. Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. (AS.L.6)
Math	CC: Mathematical Practices (MP) -Make sense of problems and persevere in solving them. -Reason abstractly and quantitatively. -Construct viable arguments and critique the reasoning of others. -Model with mathematics. -Use appropriate tools strategically. -Attend to precision. -Look for and make use of structure. -Look for and express regularity in repeated reasoning.
Reading	Integration of Knowledge and Ideas 7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. (AS.R.7) 10 - Read and comprehend complex literary and informational texts independently and proficiently. (AS.R.10)
Science	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-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. 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 particle (objects) and energy associated with the relative positions of particles HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within (objects).and multicellular organisms.

	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. 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 HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. 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.
Social Studies	Social Studies Skills 5.3 Deliberates public issues.
Speaking and Listening	Comprehension and Collaboration CCR 1 - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. (AS.SL.1) 2 - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (AS.SL.2) 3 - Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. 4 - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. (AS.SL.4) 5 - Make strategic use of digital media and visual displays of data to express information and Enhance understanding of presentations. (AS.SL.5) 6 - Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11-12 Language standards 1 and 3 on page 54 for specific expectations
Writing	CC: Writing for Literacy in History/ Social Studies, Science, and Technical Subjects (Integrates CCR) Text Types and Purposes 2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. (AS.W.2) Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4) 6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. (AS.W.6) Research to Build and Present Knowledge 7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. (AS.W.7)

Unit 4: People Skills and Teamwork	Total Learning Hours for Unit: 10

Unit 4 - Performance Assessments:

1. Using a variety of resources, the student will analyze, design, and develop an “aspects of industry” project, e.g., the student will create a “mock” business, entrepreneurship or community service project. This will be presented to a panel of persons, some of whom have industry experience.
2. Students will make an industry connection and conduct an informational interview and/or job shadow. Using a variety of presentation skills, the student will present what they learned to classmates.
3. Groups of students will plan and present a simulation/role play of employee interview and orientation, training, and evaluation. The simulation/role play should show evidence of Student mastery of FACS

Competencies 1.2, 5.7.4, 8.6.5, 8.6.6, 8.6.7, 8.6.8

Unit 4 - Leadership Alignment:

FCCLA **s**tudent Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school, community and service outreach. FCCLA activities include: Power of One – Better You and the use of built-in Rubrics.

Standards and Competencies

Standards:

People Skills and Teamwork
Leadership skills, planning process and decision making
Demonstrate sensitivity to diversity and individuals with special needs.
Demonstrate work ethics and professionalism.
1.2.8 Demonstrate work ethics and professionalism.
5.7.1 Demonstrate quality customer service that exceeds expectations.
13.5.1 Examine the role of service as a strategic component of performance.
13.5.2 Demonstrate quality services that exceed the expectations of customers.
13.5.3 Examine the relationship between employees and customer satisfaction.
13.5.4 Apply strategies for resolving complaints.
13.5.5 Demonstrate sensitivity to diversity and individuals with special needs. The manager’s role in customer service
13.5.6 Coordinate client inquiries and requests.
13.5.7 Design themes, time lines, budgets, agendas, and itineraries.
13.5.8 Organize locations, facilities, suppliers, and vendors for specific services.
13.5.9 Prepare for distribution of event materials.
13.5.10 Demonstrate skills related to promoting and publicizing events.
13.5.11 Manage programs and events for specific age groups or populations.
13.5.12 Promote wellness through recreation and leisure programs and events.
13.5.13 Demonstrate the roles of decision making and problem solving in reducing and managing conflict.
13.5.14 Create an environment that encourages and respects the ideas, perspectives, and contributions of all group members.
13.5.15 Demonstrate strategies to motivate and encourage group members.
13.5.16 Create strategies to utilize the strengths and limitations of team members.
13.5.17 Demonstrate techniques that develop team and community spirit.
13.5.18 Demonstrate ways to organize and delegate responsibilities.
13.5.19 Create strategies to integrate new members into the team.
13.5.20 Demonstrate processes for cooperating, compromising, and collaborating.

Aligned to Washington State Standards	
Arts	
Educational Technology	1 - Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2 - Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.
Health and Fitness	Health 3 Analyzes and evaluates the impact of real-life influences on health. 3.3 Evaluates the impact of social skills on health. 3.3.1 Analyze conflict situations (effective communication skills, conflict resolution). 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices.
Language	Conventions of Standard English 1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. (AS.L.1) 2 - Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. (AS.L.2) 4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. (AS.L.4)
Math	CC: Mathematical Practices (MP) Make sense of problems and persevere in solving them. Reason abstractly and quantitatively. Construct viable arguments and critique the reasoning of others. Model with mathematics. Use appropriate tools strategically. Attend to precision. Look for and make use of structure. Look for and express regularity in repeated reasoning.
Reading	Key Ideas and Details (11-12) 1 - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text (AS.R.1) 7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words (AS.R.7) 9 - Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take. (AS.R.9) 10 - Read and comprehend complex literary and informational texts independently and proficiently (AS.R.10) Craft and Structure (11-12) 4- Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10) Integration of Knowledge and Ideas (11 – 12) 7 - Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem 8 - Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., The Federalist, presidential addresses)
Science	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. HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. H.S-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity

Social Studies	Social Studies Skills 5.1 Uses critical reasoning skills to analyze and evaluate positions.
Speaking and Listening	Comprehension and Collaboration 1 - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. (AS.SL.1) 2 - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (AS.SL.2) 4 - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. (AS.SL.4) 5 - Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations. (AS.SL.5)
Writing	Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4) 6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. (AS.W.6) Research to Build and Present Knowledge 7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. (AS.W.7)

Unit 5 – Basic and Industrial Kitchen Equipment | Total Learning Hours for Unit: 30

Unit 5 – Performance Assessment

1. Students will use applied thinking skills to demonstrate and teach classmates the proper use of a selected piece of equipment.
2. After reading technical instruction manuals, students will apply decision-making and planning skills to demonstrate proper use of equipment, this must include demonstration and explanation, variety of uses, all safety issues. Related math and science principles must be clear to the targeted audience.
3. Participate in inventory, cleaning and maintenance of lab equipment as part of kitchen brigade duties.

Unit 5 – Leadership Alignment

FCCLA **s**tudent Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school, community and service outreach. For this unit, FCCLA activities include: **Food Innovation** focusing on a particular lesson topic and using built-in Rubrics.

Standards and Competencies

Standards:

-Demonstrate procedures for storage or equipment and tools.
-Employ food service management safety/sanitation program procedures.
-Examine current types and proper uses of cleaning materials and sanitizers.
-Maintain tools and equipment following safety procedures and OSHA requirements.
-Cooking, holding and service equipment

8.3.5 Demonstrate procedures for storage or equipment and tools.

Cleaning and care of equipment

8.2.2 Employ food service management safety/sanitation program procedures.
8.2.8 Examine current types and proper uses of cleaning materials and sanitizers.
8.3.3 Maintain tools and equipment following safety procedures and OSHA requirements.

Aligned to Washington State Standards	
Arts	
Educational Technology	1 Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems. 2 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior. 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning. 2.2.1 Develop skills to use technology effectively. 2.2.2 Use a variety of hardware to support learning.
Health and Fitness	Health 2.3 Understands the concepts of prevention and control of disease. 2.3.2 Analyzes personal health practices and how they affect non-communicable diseases (heart disease). 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices. Health 3.2: Evaluates health and fitness information. 3.2.1 Evaluates health and fitness information, products, and services.
Language	Conventions of Standard English CCR 6. Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. (AS.L.6)
Math	CC: Mathematical Practices (MP) -Make sense of problems and persevere in solving them. -Reason abstractly and quantitatively. -Construct viable arguments and critique the reasoning of others. -Model with mathematics. -Use appropriate tools strategically. -Attend to precision. -Look for and make use of structure. -Look for and express regularity in repeated reasoning.
Reading	Key Ideas and Details (11-12) 1 - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. (AS.R.1) 2 - Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. (AS.R.2) Craft and Structure (11-12) 4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). integration of Knowledge and Ideas (11-12) 7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. (AS.R.7) 8 - Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. (AS.R.8) Range of Reading and Level of Text Complexity (11-12) 10 - Read and comprehend complex literary and informational texts independently and proficiently. (AS.R.10)
Science	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-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. 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-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. 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. 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 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.
Social Studies	
Speaking and Listening	Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. (AS.SL.1) 2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (AS.SL.2) Presentation of Knowledge and Ideas (11 -12) 4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. (AS.SL.4) 5. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations. (AS.SL.5)
Writing	CC Writing (11-12) 2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. (AS.W.2) Production and Distribution of Writing 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4) Research to Build and Present Knowledge 7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. (AS.W.7) Range of Writing 10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. (AS.W.10)

Unit 6 - Culinary Techniques and Skills	**Total Learning Hours for Unit: 40**

Unit 6 – Performance Assessment

1. Students will perform food preparation techniques at a level 3 or better in each food preparation category according to a recognized competency standard.
2. Students will set goals to carry out and incorporate into their final portfolio, a meal planning and preparation extended learning project. The project shall include such steps and elements as planning, purchasing, preparation, documentation, cost analysis, and evaluation. A minimum of 3 courses is required, e.g., appetizer, entrée, starch, cooked vegetable, dessert.
3. EALRS and thinking skills will be taught and assessed as students demonstrate and teach others food preparation skills.

Unit 6 – Leadership Alignment

FCCLA student Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school, community, and service outreach. FCCLA activities for this unit include the: **Culinary and Management Event** including built-in Rubrics.

COMPETENCIES AND STANDARDS

Standards:
-Apply/integrate seasoning use in food preparation
-Apply recognized/standard procedures for stock, soup and sauce preparation
-Apply recognized/standard procedures for breakfast cookery
-Apply recognized/standard procedures for sandwich, hors d'oeuvres, and garnish preparation
-Apply recognized/standard procedures for salad, fruit and salad dressing preparation
-Apply recognized/standard procedures for vegetable, pasta and rice preparation
-Apply recognized/standard procedures for meat cookery
-Apply recognized/standard procedures for poultry and fish cookery
-Apply fundamentals of baking science
-Apply recognized/standard procedures for dessert preparation
-Apply recognized/standard procedures for beverage preparation
Dairy products and eggs: breakfast foods
8.5.11 Prepare breakfast meats, eggs, cereals, and batter products.
8.5.12 Demonstrate food presentation techniques.
9.6.3 Verify standards for food quality.
9.6.7 Implement procedures that provide cost effective products. sandwiches
8.5.9 Prepare sandwiches, canapés, and appetizers. Salads and garnishes
8.5.8 Prepare various salads, dressings, marinades, and spices.
8.5.12 Demonstrate food presentation techniques. Fruits and vegetables
8.5.7 Prepare various fruits, vegetables, starches, and farinaceous items

Aligned to Washington State Standards

Arts	1.2 Develops arts skills and techniques
Educational Technology	1 Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems. 1.3 Investigate and think critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior. 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning. 2.2.1 Develop skills to use technology effectively. 2.2.2 Use a variety of hardware to support learning.
Health and Fitness	Health 2.1 Understands dimensions and indicators of health. Health 2.3 Understands the concepts of prevention and control of disease. 2.3.2 Analyzes personal health practices and how they affect non-communicable diseases (heart disease). Health 3.1 Analyzes and evaluates the impact of real-life influences on health. 3.1.2 Analyzes how environmental factors impact health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices. Health 3.2: Evaluates health and fitness information. 3.2.1 Evaluates health and fitness information, products, and services. Health 3.3 Evaluates the impact of social skills on health. 3.3.1 Analyze conflict situations (effective communication skills, conflict resolution).

Language	Conventions of Standard English 1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. (AS.L.1) 2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. (AS.L.2) 4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials as appropriate. (AS.L.4)
Math	CC: Mathematical Practices (MP) Make sense of problems and persevere in solving them. Reason abstractly and quantitatively. Construct viable arguments and critique the reasoning of others. Model with mathematics. Use appropriate tools strategically. Attend to precision. Look for and make use of structure. Look for and express regularity in repeated reasoning.
Reading	Craft and Structure (11-12) 4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No.10). Integration of Knowledge and Ideas (11-12) 7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. (AS.R.7) Range of Reading and Level of Text Complexity (11-12) 10 - Read and comprehend complex literary and informational texts independently and proficiently. (AS.R.10)
Science	HS-LS3-1. Ask Questions to Clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. HS-LS4-5 Evaluate the evidence supporting claims that Changes in environmental conditions may result in (1) increases in the number of individuals of some species (2) the emergence of new species overtime, and (3) the extinction of other species 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. 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). HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. 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.

	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. 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-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. 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-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. 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. 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. 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-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.
Social Studies	Social Studies Skills 5.1 Uses critical reasoning skills to analyze and evaluate positions. 5.2 Uses inquiry based research. 5.3 Deliberates public issues.
Speaking and Listening	Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. (AS.SL.1)
Writing	Types and Purposes 2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. (AS.W.2) Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4) 5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 11-12 on page 55.)

	6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. (AS.W.6)

Unit 7 - Customer Service and Relations	Total Learning Hours for Unit: 10

Unit 7 – Performance Assessment

1. In a real or role-play situation, students will demonstrate service procedures and operations of the culinary arts field and gather evidence of customer satisfaction.
2. Students may use current available industry educational programs relating to food services and leadership for this assessment.
3. Students will be assessed on use of reading, writing, and communication essential learning as they develop, implement and present their project.
4. The student will apply/use recognized service procedures and operations in the culinary arts retail operation, contrasting opinion of fact.

Unit 7 – Leadership Alignment

FCCLA student Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school, community and service outreach. FCCLA activities include: **Hospitality,** focusing on a particular lesson topic with built-in Rubrics.

STANDARDS AND COMPETENCIES

Standards:

-Demonstrate work ethics and professionalism.
-Demonstrate quality customer service that exceeds expectations.
-Examine the role of service as a strategic component of performance.
-Examine the relationship between employees and customer satisfaction.
-Apply strategies for resolving complaints.
1.2.8 Demonstrate work ethics and professionalism.
5.7.1 Demonstrate quality customer service that exceeds expectations.
13.5.1 Examine the role of service as a strategic component of performance.
13.5.2 Demonstrate quality services that exceed the expectations of customers.
13.5.3 Examine the relationship between employees and customer satisfaction.
13.5.4 Apply strategies for resolving complaints.
13.5.5 Demonstrate sensitivity to diversity and individuals with special needs. The manager's role in customer service
13.5.6 Coordinate client inquiries and requests.

Aligned to Washington State Standards

Arts	
Educational Technology	1 Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems. 1.3 Investigate and think critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior. 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning. 2.2.1 Develop skills to use technology effectively. 2.2.2 Use a variety of hardware to support learning.
Health and Fitness	Health 3.1 Analyzes and evaluates the impact of real-life influences on health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices. Health 3.3 Evaluates the impact of social skills on health. 3.3.1 Analyze conflict situations (effective communication skills, conflict resolution).
Language	Conventions of Standard English 1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. (AS.L.1) 2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. (AS.L.2)
Math	CC: Mathematical Practices (MP)

	-Make sense of problems and persevere in solving them. -Reason abstractly and quantitatively. -Construct viable arguments and critique the reasoning of others. -Model with mathematics. -Use appropriate tools strategically. -Attend to precision. -Look for and make use of structure. -Look for and express regularity in repeated reasoning.
Reading	Key Ideas and Details 7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. (AS.R.7) 10 - Read and comprehend complex literary and informational texts independently and proficiently. (AS.R.10)
Science	
Social Studies	Economics Econ 2.1: Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices. Social Studies Skills Social Studies Skills 5.1: Uses critical reasoning skills to analyze and evaluate positions. 5.1.1 (9-10) Analyzes consequences of positions on an issue or event. Social Studies Skills 5.2: Uses inquiry-based research. 5.2.1 (9-10) Creates and uses research questions that are tied to an essential question to focus inquiry on an idea, issue, or event.
Speaking and Listening	Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. (AS.SL.1) 2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (AS.SL.2)
Writing	Writing (11-12) Production and Distribution of Writing 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4) 5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (AS.W.5) for a range of tasks, purposes, and audiences. (AS.W.10)

Unit 8 – Nutrition and Menu Planning	**Total Learning Hours for Unit: 20**

Unit 8 – Performance Assessment

Teams of students will develop a menu for a specific customer group and analyze its nutritional value, using available resources such as nutritional analysis software, USDA guidelines. The menu will address learning standards as appropriate.

As part of the culinary arts program, the student will use nutritional/dietary guidelines and menu planning principles to develop menu items that provide guests and customers with food choices that meet a range of dietary needs. Proper, efficient and appropriate food handling techniques will be used in the preparation of these menu items that will show evidence of menu analysis.

During the menu planning process students will follow steps to efficiently and correctly calculate food cost.

Unit 8 – Leadership Alignment

FCCLA student Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school, community, and service outreach. FCCLA activities might include: **Student Body** and **Financial Fitness** focusing on a particular lesson topic with built-in Rubrics.

STANDARDS AND COMPETENCIES

Standards:
-Determine nutrient requirements across the life span addressing the diversity of people, culture, and religions.
-Appraise and interpret nutritional data.
-Research the relationship of nutrition and wellness to individual and family health throughout the life span.
-Instruct individuals on nutrition for health maintenance and disease prevention.
-Appraise sources of food and nutrition information, including food labels, related to health and wellness.
-Categorize foods into exchange groups and plan menus applying the exchange system to meet various nutrient needs.
-Select appropriate special nourishment based on nutritional needs.
Food cost control in meal planning: cost planning, profitability analysis, sales and inventory control
Nutrition basics
9.3.2 Appraise and interpret nutritional data.
9.3.3 Assess principles to maximize nutrient retention in prepared foods.
14.2.1 Assess the effect of nutrients on health, appearance, and peak performance.
14.2.4 Appraise sources of food and nutrition information, including food labels, related to health and wellness. Nutritional guidelines
9.3.4 Assess the influence of socioeconomic and psychological factors on food and nutrition behavior.
9.3.5 Monitor recipe/formula proportions and modifications for food production
9.4.3 Utilize a selective menu.
9.4.4 Select appropriate special nourishment based on nutritional needs.
9.4.5 Instruct individuals on nutrition for health maintenance and disease prevention. Focusing on the menu; making menus more nutritious
8.4.1 Use computer based menu systems.
8.4.2 Apply menu-planning principles to develop and modify menus.
8.4.3 Examine food and equipment needed for menus.
8.4.4 Do menu layout and design.
8.4.6 Record performance of menu items.
9.3.6 Critique the selection of foods to promote a healthy lifestyle.

Aligned to Washington State Standards

Arts	
Educational Technology	1 Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems. 1.3 Investigate and think critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior. 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning. 2.2.2 Use a variety of hardware to support learning.
Health and Fitness	Health 2.1 Understands dimensions and indicators of health. Health 2.2 Understands the stages of growth and development. 2.2.1 Analyzes the physiological and psychological changes throughout the lifetime. (Metabolic changes) 2.2.3 Evaluates heredity factors affecting growth, development, health. (Draws conclusions about personal health history (heart, cancer, etc.) Health 2.3 Understands the concepts of prevention and control of disease. 2.3.2 Analyzes personal health practices and how they affect non-communicable diseases (heart disease). Health 3.1 Analyzes and evaluates the impact of real-life influences on health. 3.1.2 Analyzes how environmental factors impact health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices. Health 3.2: Evaluates health and fitness information. 3.2.1 Evaluates health and fitness information, products, and services. Health 3.3 Evaluates the impact of social skills on health. 3.3.1 Analyze conflict situations (effective communication skills, conflict resolution).
Language	Conventions of Standard English 1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. (AS.L.1)

	2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. (AS.L.2) 4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. (AS.L.4) 5. Demonstrate understanding of word relationships and nuances in word meanings. (AS.L.5) 6. Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. (AS.L.6)
Math	CC: Mathematical Practices (MP) Make sense of problems and persevere in solving them. Reason abstractly and quantitatively. Construct viable arguments and critique the reasoning of others. Model with mathematics. Use appropriate tools strategically. Attend to precision. Look for and make use of structure. Look for and express regularity in repeated reasoning. **Number and Quantity** Quantities -Reason Quantitatively and Use Units To Solve Problems. 3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (N. Q .3) [OPTIONAL] (S.IC.1) [OPTIONAL] -Make Inferences and Justify Conclusions from Sample Surveys, Experiments, And Observational Studies 6. Evaluate reports based on data. (S.IC.6)
Reading	Key Ideas and Details 1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. (AS.R.1) 2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. (AS.R.2) 7. Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. (AS.R.7) 8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. (AS.R.8) 10. Read and comprehend complex literary and informational texts independently and proficiently. (AS.R.10)
Science	**Washington Science Standards (Next Generation Science Standards):** 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. 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. HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. 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. 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. HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. 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
Social Studies	Social Studies Skills 5.2 Uses inquiry based research. 5.3 Deliberates public issues.
Speaking and Listening	8.1 SL Comprehension and Collaboration

	1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. (AS.SL.1) 2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (AS.SL.2)
Writing	Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4) 5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (AS.W.5) 6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. (AS.W.6) 7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. (AS.W.7) 8 - Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. (AS.W.8) Range of Writing 10 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. (AS.W.10)

Unit 9 – The Hospitality Industry	**Total hours: 15**

9- Performance Assessments:
Using a variety of resources, the student will research one aspect of the hospitality industry, comparing and contrasting it to others, and evaluating and analyzing the opportunities within that career path. The student will elaborate on their research by giving an original presentation (display, video production, Power Point presentation, etc.).

9- Leadership Alignment:
FCCLA student Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school, community and service outreach. FCCLA activities include: a portfolio and **Job Interview,** and includes the use of built-in Rubrics.

Standards and Competencies

-Explore opportunities for employment and entrepreneurial endeavors.
-Examine education and training requirements and opportunities for career paths in food production and services.
-Determine the roles and functions of individuals engaged in food production and services careers.
8.1 Analyze career paths within the food production and food services industries.
8.1.1 Explain the roles, duties, and functions of individuals engaged in food production and services careers.
8.1.2 Analyze opportunities for employment and entrepreneurial endeavors.
8.1.3 Summarize education and training requirements and opportunities for career paths in food production and services.
8.1.4 Analyze the effects of food production and services occupations on local, state, national, and global economies.
8.1.5 Create an employment portfolio for use with applying for internships and work-based learning opportunities.
8.1.6 Analyze the role of professional organizations in food production and services

Aligned Washington State Standards

Arts	
Educational Technology	1 Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems. 1.3 Investigate and think critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior. 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning. 2.2.1 Develop skills to use technology effectively. 2.2.2 Use a variety of hardware to support learning.

Health & Fitness	Health 2.1 Understands dimensions and indicators of health. Health 2.3 Understands the concepts of prevention and control of disease. 2.3.2. Analyzes personal health practices and how they affect non-communicable diseases (heart disease). Health 2.4 Acquires skills to live safely and reduce health risks. Health 3 Analyzes and evaluates the impact of real-life influences on health. 3.1.2 Analyzes how environmental factors impact health. 3.2 Evaluates health and fitness information. 3.3 Evaluates the impact of social skills on health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices. Health 3.2: Evaluates health and fitness information. 3.2.1 Evaluates health and fitness information, products, and services. Health 4.1 Analyzes personal health and fitness information. 4.1.2 Analyzes career opportunities in health and fitness (compares career opportunities).
Language	Conventions of Standard English 1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. (AS.L.1) 4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate. (AS.L.4) 6 - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. (AS.L.6)
Math	CC: Mathematical Practices (MP) -Make sense of problems and persevere in solving them. -Reason abstractly and quantitatively. -Construct viable arguments and critique the reasoning of others. -Model with mathematics. -Use appropriate tools strategically. -Attend to precision. -Look for and make use of structure. -Look for and express regularity in repeated reasoning.
Reading	Key Ideas and Details (11- 12) 2 - Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text. Integration of Knowledge and Ideas (11 – 12) 7 - Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. Range of Reading and Level of Text Complexity (11 – 12) 10 - Read and comprehend complex literary and informational texts independently and proficiently.(AS.R.10)
Science	**Washington Science Standards (Next Generation Science Standards):** 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.
Social Studies	Economics Economics 2.1 Understands that people have to make choices between wants and needs and evaluate outcomes of those choices. Social Studies Skills 5.2 Uses inquiry based research.
Speaking and Listening	Comprehension and Collaboration (11-12) 1 - Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on

	grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. Presentation of Knowledge and Ideas (11-12) 4 - Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range or formal and informal tasks.
Writing	Writing for Literacy in History/ Social Studies, Science, and Technical Subjects (9 – 10) (Integrates CCR) Text Types and Purposes CCR 2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. (AS.W.2) 3 - Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. (AS.W.3) Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4) 5 - Develop and strengthen writing a needed by planning, revising, editing, rewriting or trying a new approach, focusing on what is most significant for a specific purpose and audience. 6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. (AS.W.6) Research to Build and Present Knowledge 7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. (AS.W.7) Range of Writing 10 – Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences**.** (AS.W.10)

Unit 10 – Safety and Sanitation — Total Hours 15

10 - Performance Assessments:

-The student will develop and use, within the day-to-day operation of the culinary kitchen, an HACCP flow chart (sanitation) that demonstrates the cause/effect relationship between food handling and serving.

-The student will pass at 90% a recognized food handler test, and demonstrate knowledge and understanding of food service safety, related vocabulary comprehension, and cause/effect relationships relative to food borne illness.

-The student will pass at 90% a recognized safety test, and demonstrate knowledge and understanding of safety practices in the food service facility, related vocabulary comprehension, and cause/effect relationships relative to proper use of utensils and equipment.

-All sanitation and safety procedures will be continuously applied and assessed in learning activities.

10 - Leadership Alignment:

FCCLA student Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school, community and service outreach. FCCLA activities might include: **Leaders at Work** and the use of built-in Rubrics.

Standards and Competencies

8.2 Demonstrate food safety and sanitation procedures.

8.2.1 Identify characteristics of major food borne pathogens, their role in causing illness, foods involved in outbreaks, and methods of prevention.

8.2.2 Employ food service management safety/sanitation program procedures, including CPR and first aid.

8.2.3 Use knowledge of systems for documenting, investigating, reporting, and preventing food borne illness.

8.2.4 Use the Hazard Analysis Critical Control Point (HACCP) and crisis management principles and procedures during food handling processes to minimize the risks of foodborne illness.

8.2.5 Practice good personal hygiene/health procedures, including dental health and weight management, and report symptoms of illness.

8.2.6 Demonstrate proper purchasing, receiving, storage, and handling of both raw and prepared foods.
8.2.7 Demonstrate safe food handling and preparation techniques that prevent cross contamination from potentially hazardous foods, between raw and ready-to-eat foods, and between animal and fish sources and other food products.
8.2.8 Analyze current types of cleaning materials and sanitizers for proper uses and safety hazards.
8.2.9 Use Occupational Safety and Health Administration's (OSHA) Right to Know Law and Materials Safety Data Sheets (MSDS) and explain their requirements in safe handling and storage of hazardous materials.
8.2.10 Demonstrate safe and environmentally responsible waste disposal and recycling methods.

Demonstrate ability to maintain necessary records to document time and temperature control, HACCP, employee health, maintenance of equipment, and other elements of food preparation, storage, and presentation.

Aligned Washington State Standards

Arts	
Educational Technology	1 Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems. 1.3 Investigate and think critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior. 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning. 2.2.1 Develop skills to use technology effectively. 2.2.2 Use a variety of hardware to support learning.
Health & Fitness	Health 2.1 Understands dimensions and indicators of health. Health 2.3 Understands the concepts of prevention and control of disease. 2.3.2. Analyzes personal health practices and how they affect non-communicable diseases (heart disease). Health 2.4 Acquires skills to live safely and reduce health risks. Health 3 Analyzes and evaluates the impact of real-life influences on health. 3.1.2 Analyzes how environmental factors impact health. 3.2 Evaluates health and fitness information. 3.3 Evaluates the impact of social skills on health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices. Health 3.2: Evaluates health and fitness information. 3.2.1 Evaluates health and fitness information, products, and services. Health 4.1 Analyzes personal health and fitness information. 4.1.2 Analyzes career opportunities in health and fitness (compares career opportunities).
Language	
Math	CC: Mathematical Practices (MP) Make sense of problems and persevere in solving them. Reason abstractly and quantitatively. Construct viable arguments and critique the reasoning of others. Model with mathematics. Use appropriate tools strategically. Attend to precision. Look for and make use of structure. Look for and express regularity in repeated reasoning.
Reading	Integration of Knowledge and Ideas 7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. (AS.R.7)

	10 - Read and comprehend complex literary and informational texts independently and proficiently. (AS.R.10)
Science	**Washington Science Standards (Next Generation Science Standards):** 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. H. S-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. 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.
Social Studies	Social Studies Skills 5.3 Deliberates public issues.
Speaking and Listening	Comprehension and Collaboration CCR 1 - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. (AS.SL.1) 2 - Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (AS.SL.2) 3 - Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. 4 - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. (AS.SL.4) 5 - Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations. (AS.SL.5) 6 - Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11-12 Language standards 1 and 3 on page 54 for specific expectations
Writing	CC: Writing for Literacy in History/ Social Studies, Science, and Technical Subjects (Integrates CCR) Text Types and Purposes 2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. (AS.W.2) Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4) 6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. (AS.W.6) Research to Build and Present Knowledge

	7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. (AS.W.7)

Unit 11 – Kitchen Basics | Total Hours: 30

11 - Performance Assessments:

Having determined the recipe yield needed, the student will convert (increase or decrease) a recipe, analyze and make recipe ingredient adjustments, and determine modifications in preparation. The student will test the recipe for conversion success.

Students will develop and use a competency performance rubric (which includes all framework columns) for assessing the proper and efficient use of recognized standard preparation methods. Students will perform at a level 3 or better when assessed using the rubric, demonstrating persistence to reach these goals.

NOTE: In the case where a competency performance rubric is used for scoring, assessment shall be of all columns. This applies wherever a performance rubric is used.

Competency performance levels are defined as follows:

Level 1 – Has some knowledge, but cannot perform the task Level 2 – Needs assistance to perform the task

Level 3 – Performs the task with little or no assistance

Level 4 – Able to teach the task

11 - Leadership Alignment:

FCCLA student Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school, community and service outreach. FCCLA activities include: **Culinary and Management Events** focusing on a particular lesson topic, and using built-in Rubrics.

Standards and Competencies

Kitchen Basics

-Use standardized recipes/measurements

-Demonstrate a variety of cooking methods including roasting, baking, broiling, sautéing, frying, deep frying, braising, stewing, poaching, steaming, and other emerging technologies.

-Apply the fundamental of time and temperature to cooking, cooling, and reheating of a variety of foods.

-Demonstrate appropriate food presentation techniques.

-Demonstrate ability to select, store, prepare, and serve nutritious and aesthetically pleasing foods.

8.4 Demonstrate menu planning principles and techniques based on standardized recipes to meet customer needs.

8.4.1 Use computer based menu systems to develop and modify menus.

8.4.2 Apply menu-planning principles to develop and modify menus.

8.4.3 Analyze food, equipment, and supplies needed for menus.

8.4.4 Develop a variety of menu layouts, themes, and design styles.

8.4.5. Prepare requisitions for food, equipment, and supplies to meet production requirements.

8.4.6. Record performance of menu items to analyze sales and determine menu revisions.

8.4.7Apply principles of Measurement, Portion Control, Conversions, Food Cost Analysis and Control, Menu Terminology, and Menu Pricing to menu planning.

8.5 Demonstrate professional food preparation methods and techniques for all menu categories to produce a variety of food products that meet customer needs.

8.5.1 Demonstrate professional skills in safe handling of knives, tools, and equipment.

8.5.2 Demonstrate professional skill for a variety of cooking methods including roasting, broiling, smoking, grilling, sautéing, pan frying, deep frying, braising, stewing, poaching, steaming, and baking using professional equipment and current technologies.

8.5.3 Utilize weights and measurement tools to demonstrate knowledge of portion control and proper scaling and measurement techniques.

8.5.4 Apply the fundamentals of time, temperature, and cooking methods to cooking, cooling, reheating, and holding of variety of foods.

8.5.5 Prepare various meats, seafood, and poultry using safe handling and professional preparation techniques.

8.5.6 Prepare various stocks, soups, and sauces using safe handling and professional preparation techniques.

8.5.7 Prepare various fruits, vegetables, starches, legumes, dairy products, fats, and oils using safe handling and professional preparation techniques.

8.5.8 Prepare various salads, dressings, marinades, and spices using safe handling and professional preparation techniques. 8.5.9 Prepare sandwiches, canapes and appetizers using safe handling and professional preparation techniques. 8.5.10 Prepare breads, baked goods and desserts using safe handling and professional preparation techniques. 8.5.11 Prepare breakfast meats, eggs, cereals, and batter products using safe handling and professional preparation techniques. 8.5.12 Demonstrate professional plating, garnishing, and food presentation techniques. 8.5.13 Examine the applicability of convenience food items. 9.5.14 Demonstrate cooking methods that increase nutritional value, lower calorie and fat content, and utilize herbs and spices to enhance flavor.	
Aligned Washington State Standards	
Arts	
Educational Technology	1 Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems. 1.3 Investigate and think critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior. 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning. 2.2.1 Develop skills to use technology effectively. 2.2.2 Use a variety of hardware to support learning.
Health & Fitness	Health 2.1 Understands dimensions and indicators of health. Health 2.3 Understands the concepts of prevention and control of disease. 2.3.2. Analyzes personal health practices and how they affect non-communicable diseases (heart disease). Health 2.4 Acquires skills to live safely and reduce health risks. Health 3 Analyzes and evaluates the impact of real-life influences on health. 3.1.2 Analyzes how environmental factors impact health. 3.2 Evaluates health and fitness information. 3.3 Evaluates the impact of social skills on health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices. Health 3.2: Evaluates health and fitness information. 3.2.1 Evaluates health and fitness information, products, and services. Health 4.1 Analyzes personal health and fitness information. 4.1.2 Analyzes career opportunities in health and fitness (compares career opportunities).
Language	
Math	CC: Mathematical Practices (MP) Make sense of problems and persevere in solving them. Reason abstractly and quantitatively. Construct viable arguments and critique the reasoning of others. Model with mathematics. Use appropriate tools strategically. Attend to precision. Look for and make use of structure. Look for and express regularity in repeated reasoning.
Reading	Integration of Knowledge and Ideas 7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. (AS.R.7) 10 - Read and comprehend complex literary and informational texts independently and proficiently. (AS.R.10)

Science	**Washington Science Standards (Next Generation Science Standards):** S-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). HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. 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-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. 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-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. 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 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. HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. 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. 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. 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.
Social Studies	Social Studies Skills 5.3 Deliberates public issues.
Speaking and Listening	Comprehension and Collaboration CCR 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. (AS.SL.1) 2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (AS.SL.2) 3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used. 4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. (AS.SL.4) 5. Make strategic use of digital media and visual displays of data to express information and Enhance understanding of presentations. (AS.SL.5) 6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11-12 Language standards 1 and 3 on page 54 for specific expectations
Writing	CC: Writing for Literacy in History/ Social Studies, Science, and Technical Subjects (Integrates CCR)

	Text Types and Purposes 2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. (AS.W.2) Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4) 6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. (AS.W.6) Research to Build and Present Knowledge 7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. (AS.W.7)

Unit 12 – Basic Industrial Kitchen Equipment — Total Hours: 30

12 - Performance Assessments:

-Students will develop and use a competency performance rubric for assessing the proper and efficient use of equipment, hand tools, and utensils. Students will perform at a level 3 or better when assessed using the rubric, demonstrating persistence to reach these goals.

-Given a food service situation students will demonstrate correct use of appropriate equipment. They will read technical manuals and be able to explain the reasons for correct use including relates math and science principles.

-After reading technical instruction manuals, students will apply decision-making and planning skills to demonstrate proper use of equipment, this must include demonstration and explanation, variety of uses, all safety issues. Related math and science principles must be clear to the targeted audience.

12 - Leadership Alignment:

FCCLA student Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school, community, and service outreach. FCCLA activities include: the **Planning Process focusing** on a particular lesson topic.

Standards and Competencies

-Demonstrate procedures for storage or equipment and tools.
-Employ food service management safety/sanitation program procedures.
-Examine current types and proper uses of cleaning materials and sanitizers.
-Maintain tools and equipment following safety procedures and OSHA requirements.
8.3 Demonstrate industry standards in selecting, using, and maintaining food production and food service equipment.
8.3.1 Operate tools and equipment following safety procedures and OSHA requirements.
8.3.2 Maintain tools and equipment following safety procedures and OSHA requirements.
8.3.3 Demonstrate procedures for cleaning and sanitizing equipment, serving dishes, glassware, and utensils to meet industry standards and OSHA requirements.
8.3.4 Analyze equipment purchases based on long-term business needs, specific regulations, and codes related to foods.
8.3.5 Demonstrate procedures for safe and secure storage of equipment and tools.

Identify a variety of types of equipment for food processing, cooking, holding, storing, and serving, including hand tools and small ware.

Aligned Washington State Standards

Arts	
Educational Technology	1 Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems. 1.3 Investigate and think critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior. 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning. 2.2.1 Develop skills to use technology effectively.

	2.2.2 Use a variety of hardware to support learning
Health & Fitness	Health 2.1 Understands dimensions and indicators of health. Health 2.3 Understands the concepts of prevention and control of disease. 2.3.2. Analyzes personal health practices and how they affect non-communicable diseases (heart disease). Health 2.4 Acquires skills to live safely and reduce health risks. Health 3 Analyzes and evaluates the impact of real-life influences on health. 3.1.2 Analyzes how environmental factors impact health. 3.2 Evaluates health and fitness information. 3.3 Evaluates the impact of social skills on health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices. Health 3.2: Evaluates health and fitness information. 3.2.1 Evaluates health and fitness information, products, and services. Health 4.1 Analyzes personal health and fitness information. 4.1.2 Analyzes career opportunities in health and fitness (compares career opportunities).
Language	
Math	CC: Mathematical Practices (MP) -Make sense of problems and persevere in solving them. -Reason abstractly and quantitatively. -Construct viable arguments and critique the reasoning of others. -Model with mathematics. -Use appropriate tools strategically. -Attend to precision. -Look for and make use of structure. -Look for and express regularity in repeated reasoning.
Reading	Key Ideas and Details (11-12) 1 - Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. (AS.R.1) 2 - Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. (AS.R.2) Craft and Structure (11-12) 4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). integration of Knowledge and Ideas (11-12) 7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. (AS.R.7) 8 - Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. (AS.R.8) Range of Reading and Level of Text Complexity (11-12) 10 - Read and comprehend complex literary and informational texts independently and proficiently. (AS.R.10)
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-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

	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). HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. 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. 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. 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.
Social Studies	
Speaking and Listening	Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. (AS.SL.1) 2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (AS.SL.2) Presentation of Knowledge and Ideas (11 -12) 4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. (AS.SL.4) 5. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations. (AS.SL.5)
Writing	CC Writing (11-12) 2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. (AS.W.2) Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4) Research to Build and Present Knowledge 7 - Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. (AS.W.7) Range of Writing 10 - Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. (AS.W.10)

Unit 13 – Culinary Techniques and Skills	**Total Hours: 70**

13 - Performance Assessments:
Students demonstrate and teach others food preparation skills. Catering Events
Culinary Competitions Special events Cooking Labs Community Service Guest Chefs

13 - Leadership Alignment:
FCCLA student Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school, community, and service outreach. FCCLA projects include: **Culinary Arts** focusing on a particular lesson topic, using built-in Rubrics.

Standards and Competencies

Culinary Techniques and Skills
-Apply/integrate seasoning use in food preparation
-Apply recognized/standard procedures for stock, soup and sauce preparation
-Apply recognized/standard procedures for breakfast cookery
-Apply recognized/standard procedures for sandwich, hors d'oeuvres, and garnish preparation
-Apply recognized/standard procedures for salad, fruit and salad dressing preparation
-Apply recognized/standard procedures for vegetable, pasta and rice preparation
-Apply recognized/standard procedures for meat cookery
-Apply recognized/standard procedures for poultry and fish cookery
-Apply fundamentals of baking science
-Apply recognized/standard procedures for dessert preparation
-Apply recognized/standard procedures for beverage preparation

8.5 Demonstrate professional food preparation methods and techniques for all menu categories to produce a variety of food products that meet customer needs.
8.5.1 Demonstrate professional skills in safe handling of knives, tools, and equipment.
8.5.2 Demonstrate professional skill for a variety of cooking methods including roasting, broiling, smoking, grilling, sautéing, pan frying, deep frying, braising, stewing, poaching, steaming, and baking using professional equipment and current technologies.
8.5.3 Utilize weights and measurement tools to demonstrate knowledge of portion control and proper scaling and measurement techniques.
8.5.4 Apply the fundamentals of time, temperature, and cooking methods to cooking, cooling, reheating, and holding of variety of foods.
8.5.5 Prepare various meats, seafood, and poultry using safe handling and professional preparation techniques.
8.5.6 Prepare various stocks, soups, and sauces using safe handling and professional preparation techniques.
8.5.7 Prepare various fruits, vegetables, starches, legumes, dairy products, fats, and oils using safe handling and professional preparation techniques.
8.5.8 Prepare various salads, dressings, marinades, and spices using safe handling and professional preparation techniques.
8.5.9 Prepare sandwiches, canapes and appetizers using safe handling and professional preparation techniques.
8.5.10 Prepare breads, baked goods and desserts using safe handling and professional preparation techniques.
8.5.11 Prepare breakfast meats, eggs, cereals, and batter products using safe handling and professional preparation techniques.
8.5.12 Demonstrate professional plating, garnishing, and food presentation techniques.

Examine the applicability of convenience food items.

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Arts	
Educational Technology	1 <u>Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems</u>. 1.3 Investigate and think critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2 <u>Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.</u> 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning. 2.2.1 Develop skills to use technology effectively.

	2.2.2 Use a variety of hardware to support learning
Health & Fitness	Health 2.1 Understands dimensions and indicators of health. Health 2.3 Understands the concepts of prevention and control of disease. 2.3.2. Analyzes personal health practices and how they affect non-communicable diseases (heart disease). Health 2.4 Acquires skills to live safely and reduce health risks. Health 3 Analyzes and evaluates the impact of real-life influences on health. 3.1.2 Analyzes how environmental factors impact health. 3.2 Evaluates health and fitness information. 3.3 Evaluates the impact of social skills on health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices. Health 3.2: Evaluates health and fitness information. 3.2.1 Evaluates health and fitness information, products, and services. Health 4.1 Analyzes personal health and fitness information. 4.1.2 Analyzes career opportunities in health and fitness (compares career opportunities).
Language	
Math	CC: Mathematical Practices (MP) Make sense of problems and persevere in solving them. Reason abstractly and quantitatively. Construct viable arguments and critique the reasoning of others. Model with mathematics. Use appropriate tools strategically. Attend to precision. Look for and make use of structure. Look for and express regularity in repeated reasoning.
Reading	Craft and Structure (11-12) 4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10). Integration of Knowledge and Ideas (11-12) 7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. (AS.R.7) Range of Reading and Level of Text Complexity (11-12) 10 -Read and comprehend complex literary and informational texts independently and proficiently. (AS.R.10)
Science	**Washington Science Standards (Next Generation Science Standards):** HS-LS3-1 Ask Questions to Clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. HS-LS4-5 Evaluate the evidence supporting claims that Changes in environmental conditions may result in (1) increases in the number of individuals of some species (2) the emergence of new species overtime, and (3) the extinction of other species 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. 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-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. 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). HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. 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. 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. HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. 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. 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. 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.
Social Studies	Social Studies Skills 5.1 Uses critical reasoning skills to analyze and evaluate positions. 5.2 Uses inquiry based research. 5.3 Deliberates public issues.
Speaking and Listening	Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. (AS.SL.1)
Writing	Types and Purposes 2 - Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content. (AS.W.2)

	Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4) 5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 11-12 on page 55.) 6 - Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. (AS.W.6)

Unit 14 – Customer Service and Relations — Total Hours: 10

14 - Performance Assessments:

I1 PREPARE FOR THE TRANSITION TO EMPLOYEE AND FROM EMPLOYEE TO SUPERVISOR

I1.1 Demonstrate effective communication and interpersonal skills: a) interact with others using tact and courtesy in both verbal and non-verbal communication; b) set and utilize appropriate rules when interacting with others; c) use effective structure and presentation style when speaking; d) use effective listening skills; e) adapt communication skills to appropriate environment and medium

I1.2 Demonstrate the ability to work as a group member in the production of quality work: a) knowledge of own and others' interactive styles; b) ability to relate and interact effectively in teams consisting of individuals with differing interests, genders, backgrounds and professions

I1.3 Logically and effectively solve personal and professional problems: a) adapt to change; b) deal constructively with stress; c) conflict resolution

I1.4 Demonstrate ability to set and work towards goals within a set time line: a) set priorities, plan time lines, take action, evaluate and adjust accordingly; b) identify professional goals; c) reflect on short-term goals to measure personal effectiveness

I1.5 Carry out steps in job search and obtain
employment: a) job interview; b) correct professional appearance and conduct; c) commit to industry work ethics

I1.6 Identify and value quality: a) able to identify standards of quality; b) assess a service/product and determine if meets defined quality standard; c) able to define quality process;
d) willing to adjust to meet quality standards

I1.7 Describe procedure to progressive discipline. I1.8 Discuss techniques for motivating employees.

I1.9 Outline current federal and state employment laws. I1.10 Use proper evaluative techniques.

14 - Leadership Alignment:

FCCLA student Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school, community and service outreach. FCCLA activities include**: Interpersonal Relationships** or **Hospitality,** focusing on a particular lesson topic with built-in Rubrics.

Standards and Competencies

STANDARDS

The importance of customer relations

1.2.8 Demonstrate work ethics and professionalism.

5.7.1 Demonstrate quality customer service that exceeds expectations.

13.5.1 Examine the role of service as a strategic component of performance.

13.5.2 Demonstrate quality services that exceed the expectations of customers.

13.5.3 Examine the relationship between employees and customer satisfaction.

13.5.4 Apply strategies for resolving complaints.

13.5.5 Demonstrate sensitivity to diversity and individuals with special needs. The manager's role in customer service

13.5.6 Coordinate client inquiries and requests.

13.5.7 Organize locations, facilities, suppliers, and vendors for specific services.

13.5.8 Prepare for distribution of event materials.

13.5.9 Demonstrate skills related to promoting and publicizing events.

13.5.10 Manage programs and events for specific age groups or populations.

13.5.11 Promote wellness through recreation and leisure programs and events.
13.5.12 Demonstrate the roles of decision making and problem solving in reducing and managing conflict.
13.5.13 Create an environment that encourages and respects the ideas, perspectives, and contributions of all group members.
13.5.14 Demonstrate strategies to motivate and encourage group members.
13.5.15 Create strategies to utilize the strengths and limitations of team members.
13.5.16 Demonstrate techniques that develop team and community spirit.
13.5.17 Demonstrate ways to organize and delegate responsibilities.
13.5.18 Create strategies to integrate new members into the team.
Demonstrate processes for cooperating, compromising, and collaborating

I1.1 Demonstrate effective communication and interpersonal skills: a) interact with others using tact and courtesy in both verbal and non-verbal communication; b) set and utilize appropriate rules when interacting with others; c) use effective structure and presentation style when speaking; d) use effective listening skills; e) adapt communication skills to appropriate environment and medium
I1.2 Demonstrate the ability to work as a group member in the production of quality work: a) knowledge of own and others' interactive styles; b) ability to relate and interact effectively in teams consisting of individuals with differing interests, genders, backgrounds and professions
I1.3 Logically and effectively solve personal and professional problems: a) adapt to change; b) deal constructively with stress; c) conflict resolution
I1.4 Demonstrate ability to set and work towards goals within a set time line: a) set priorities, plan time lines, take action, evaluate and adjust accordingly; b) identify professional goals; c) reflect on short-term goals to measure personal effectiveness
I1.5 Carry out steps in job search and obtain
employment: a) job interview; b) correct professional appearance and conduct; c) commit to industry work ethics
I1.6 Identify and value quality: a) able to identify standards of quality; b) assess a service/product and determine if meets defined quality standard; c) able to define quality process;
d) willing to adjust to meet quality standards
I1.7 Describe procedure to progressive discipline. I1.8 Discuss techniques for motivating employees.
I1.9 Outline current federal and state employment laws. I1.10 Use proper evaluative techniques.

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Educational Technology	1 Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems. 1.3 Investigate and think critically: Research, manage and evaluate information and solve problems using digital tools and resources. 2 Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior. 2.2 Operate systems: Understand technology systems and use hardware and networks to support learning. 2.2.1 Develop skills to use technology effectively. 2.2.2 Use a variety of hardware to support learning
Health & Fitness	Health 2.1 Understands dimensions and indicators of health. Health 2.3 Understands the concepts of prevention and control of disease. 2.3.2. Analyzes personal health practices and how they affect non-communicable diseases (heart disease). Health 2.4 Acquires skills to live safely and reduce health risks. Health 3 Analyzes and evaluates the impact of real-life influences on health. 3.1.2 Analyzes how environmental factors impact health. 3.2 Evaluates health and fitness information. 3.3 Evaluates the impact of social skills on health. 3.1.3 Evaluates environmental risks associated with certain occupational, residential, and recreational choices. Health 3.2: Evaluates health and fitness information. 3.2.1 Evaluates health and fitness information, products, and services. Health 4.1 Analyzes personal health and fitness information.

	4.1.2 Analyzes career opportunities in health and fitness (compares career opportunities).
Language	
Math	CC: Mathematical Practices (MP) -Make sense of problems and persevere in solving them. -Reason abstractly and quantitatively. -Construct viable arguments and critique the reasoning of others. -Model with mathematics. -Use appropriate tools strategically. -Attend to precision. -Look for and make use of structure. -Look for and express regularity in repeated reasoning.
Reading	Key Ideas and Details 7 - Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. (AS.R.7) 10 - Read and comprehend complex literary and informational texts independently and proficiently. (AS.R.10)
Science	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. HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
Social Studies	Economics Econ 2.1: Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices. Social Studies Skills Social Studies Skills 5.1: Uses critical reasoning skills to analyze and evaluate positions. 5.1.1 (9-10) Analyzes consequences of positions on an issue or event. Social Studies Skills 5.2: Uses inquiry-based research. 5.2.1 (9-10) Creates and uses research questions that are tied to an essential question to focus inquiry on an idea, issue, or event.
Speaking and Listening	Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. (AS.SL.1) 2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (AS.SL.2)
Writing	Writing (11-12) Production and Distribution of Writing 4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4) 5 - Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (AS.W.5) for a range of tasks, purposes, and audiences. (AS.W.10)

Unit 15 – Nutrition and Menu Planning	**Total Hours: 10**

15 - Performance Assessments:

As part of the culinary arts retail operation, the student will use nutritional/dietary guidelines and menu planning principles to develop menu items that provide guests and customers with food choices that meet a range of dietary needs. Proper, efficient and appropriate food handling techniques will be used in the preparation of these menu items that will show evidence of menu analysis.

The student will research and review a number of marketing/advertising styles and examples to develop a menu that could be used in the culinary arts retail operation.

15 - Leadership Alignment:

FCCLA student Leadership activities will use a variety of formative and summative assessments that might include: class organization with officers and committees using **Parliamentary Procedure**; brainstorming for course /project ideas; project planning, group interaction; creative use of materials, historical perspectives, real - world problem solving; technical skills; career & life skills development and other 21st century skills. Students will use the information as they practice/compete in individual and team competitions, including the Hospitality Cup (WRA) and perform in and out of school, community, and service outreach. FCCLA activities might include**: Financial Fitness** and **Nutrition and Wellness** focusing on a particular lesson topic with built-in Rubrics.

Standards and Competencies

STANDARDS

-Determine nutrient requirements across the life span addressing the diversity of people, culture, and religions.
-Appraise and interpret nutritional data.
-Research the relationship of nutrition and wellness to individual and family health throughout the life span.
-Instruct individuals on nutrition for health maintenance and disease prevention.
-Appraise sources of food and nutrition information, including food labels, related to health and wellness.
-Categorize foods into exchange groups and plan menus applying the exchange system to meet various nutrient needs.
-Select appropriate special nourishment based on nutritional needs.
-Food cost control in meal planning: cost planning, profitability analysis, sales and inventory control
8.4 Demonstrate menu planning principles and techniques based on standardized recipes to meet customer needs.
8.4.1 Use computer based menu systems to develop and modify menus.
8.4.2 Apply menu-planning principles to develop and modify menus.
8.4.3 Analyze food, equipment, and supplies needed for menus.
8.4.4 Develop a variety of menu layouts, themes, and design styles.
8.4.5 Prepare requisitions for food, equipment, and supplies to meet production requirements.
8.4.6 Record performance of menu items to analyze sales and determine menu revisions.

Apply principles of Measurement, Portion Control, Conversions, Food Cost Analysis and Control, Menu Terminology, and Menu Pricing to menu planning.

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Science	**Washington Science Standards (Next Generation Science Standards):** 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. 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. HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. 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. 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. HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. 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.
Social Studies	Social Studies Skills 5.2 Uses inquiry based research. 5.3 Deliberates public issues.
Speaking and Listening	8.1 SL Comprehension and Collaboration 1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. (AS.SL.1) 2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (AS.SL.2)
Writing	Production and Distribution of Writing 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (AS.W.4)

	5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (AS.W.5) 6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others. (AS.W.6) 7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation. (AS.W.7) 8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism. (AS.W.8) <u>Range of Writing</u> 10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences. (AS.W.10)

21st Century Skills		
Check those that students will demonstrate in this course:		
LEARNING & INNOVATION **Creativity and Innovation** ☒Think Creatively ☒Work Creatively with Others ☒Implement Innovations **Critical Thinking and Problem Solving** ☒Reason Effectively ☒**U**se Systems Thinking ☒Make Judgments and Decisions ☒Solve Problems **Communication and Collaboration** ☒Communicate Clearly ☒Collaborate with Others	**INFORMATION, MEDIA & TECHNOLOGY SKILLS** **Information Literacy** ☒Access and /evaluate Information ☒Use and Manage Information **Media Literacy** ☒Analyze Media ☒Create Media Products **Information, Communications and Technology (ICT Literacy)** ☒Apply Technology Effectively	**LIFE & CAREER SKILLS** **Flexibility and Adaptability** ☒Adapt to Change ☒Be Flexible **Initiative and Self-Direction** ☒Manage Goals and Time ☒Work Independently ☒Be Self-Directed Learners **Social and Cross-Cultural** ☒Interact Effectively with Others ☒Work Effectively in Diverse Teams **Productivity and Accountability** ☒Manage Projects ☒Produce Results **Leadership and Responsibility** ☒Guide and Lead Others ☒Be Responsible to Others

Statewide Framework Document for: 261201

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 life science or 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.

Agricultural Biotechnology		
Course Title: Agricultural (Animal and Plant) Biotechnology		**Total Framework Hours: 180**
CIP Code: 261201	☒**Exploratory** ☐**Preparatory**	**Date Last Modified: April 25, 2016**
Career Cluster: Agriculture, Food, and Natural Resources		**Cluster Pathway: Biotechnology Systems**
Eligible for Equivalent Credit in: ☐ **Math** ☒ **Science**		**Total Number of Units: 6**

Course Overview

Summary:
Animal and Plant Biotechnology is a course that focuses on the application of the biological sciences, biochemistry, and genetics to the preparation of new and enhanced agricultural, environmental, clinical, and industrial products, including the commercial exploitation of microbes, plants, and animals. Includes instruction in bioinformatics, gene identification, phylogenetic and comparative genomics, bioinorganic chemistry, immunoassaying, DNA sequencing, xenotransplantation, genetic engineering, industrial microbiology, drug and biologic development enzyme-based production processes, patent law, biotechnology management and marketing, applicable regulations, and biotechnology ethics.

The course will include areas of study such as laboratory protocols and safety, cells, DNA and protein, genetically modified organisms, micropropagation, polymerase chain reaction, and research in biotechnology.

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

Unit 1: Foundations of Biotechnology	Total Learning Hours for Unit: 20

Unit Summary: This unit will include instruction in; Foundations of Biotechnology, Standard Operating Procedures, and the Basics of Cells and DNA, Competencies include:

1.1 Modern biotechnology has foundations in historical technologies, such as fermentation and selective breeding, while utilizing newer fields, such as molecular biology, bioengineering, and bioinformatics.
1.2 Organization and record keeping are important to success in biotechnology.
1.3 Innovations in biotechnology have led to more efficient production of agricultural goods and may support sustainable agricultural practices in the future
1.4 Ethical questions surrounding applications of biotechnology, which generate discussions and varying opinions that drive policy and regulation, are based on personal beliefs.
1.5 Working in biotechnology laboratory requires diligence in following safety procedures and rules.
1.6 Knowledge of the location of safety equipment is essential when working in the laboratory
1.7 Safety Data Sheets (SDS) contain important information related to the proper use and cleanup of biological and chemical materials.
1.8 Proper and accurate measurement is important for laboratory investigation.
1.9 Good Laboratory Procedures (GLPs) ensure the quality and integrity of laboratory data used to support registration of a product.
1.10 Culturing research specimen in the laboratory requires the use of sterile techniques to limit contamination
1.11 Prokaryotic and eukaryotic cells, which are used for biotechnological applications, can be cultured and observed easily in the laboratory.
1.12 Understanding DNA structure is essential for bioengineering processes
1.13 DNA is studied in order to understand how living things work.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Complete a series of activities to explore the applications of biotechnology
- Write a definition of biotechnology
- Develop and maintain a Laboratory Notebook to record observations and protocols.
- Determine the date and significance of a biotechnological discovery.
- Work collaboratively to develop a timeline of biotechnology discoveries.
- Explore their personal beliefs and knowledge to gain perspective on practices in biotechnology.
- Review the Lab Safety Manual and determine safe practices for the biotechnology laboratory
- Diagram and describe where emergency equipment and safety hazards in the biotechnology laboratory are located.
- Explain appropriate uses of safety and emergency equipment.
- Use SDS forms to determine the proper use and clean-up of compounds used in the course.
- Mix diluted solutions based on the percentage of a substance desired.
- Prepare solutions based on the desired molar concentration.
- Use pipets to transfer accurate volumes of solutions.
- Transfer microliters of solutions using a micropipet.
- Prepare and pour nutrient agar plates using sterile procedures.

- Prepare culture plates using proper sterile and streaking techniques.
- Observe differences in growth patterns of prokaryote and eukaryote model organisms.
- Develop a model of a DNA strand as a class and using simulation materials.
- Research DNA replication and develop a visual representation of the replication process.
- Determine the location of a specific gene sequence in a DNA segment.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will work creatively with others and collaborate with others to develop a timeline of biotechnology discoveries.
Students will use judgements and decisions when working in a biotechnology laboratory to follow safety procedures and rules.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards –Cluster Skills, Career Ready Practices, and Biotechnology Systems

CRP.01.01: Model personal responsibility in the workplace and community.
CRP.08.01: Apply reason and logic to evaluate workplace and community situations from multiple perspectives.
BS.01.01: Investigate and explain the relationship between past, current and emerging applications of biotechnology in agriculture (e.g., major innovators, historical developments, potential applications of biotechnology, etc.).
BS.01: Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., historical events, societal trends, ethical and legal implications, etc.).
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.02.03: Apply standard operating procedures for the safe handling of biological and chemical materials in a laboratory.
BS.02.04: Safely manage and dispose of biological materials, chemicals and wastes according to standard operating procedures.
BS.02.05: Examine and perform scientific procedures using microbes, DNA, RNA and proteins in a laboratory.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):
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.
HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellularorganisms.
HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*
HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
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.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Obtaining, Evaluating, and Communicating Information	LS1. A: Structure and Function:	Patterns
Planning and Carrying Out Investigations	LS3.A Inheritance of Traits	Cause and Effect: Mechanism and Prediction
Developing and Using Models		Scale, Proportion, and Quantity
		Systems and System Models:
		Structure and Function:

Washington English Language Arts Standards (Common Core State Standards)

RST.11-12.1 – Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.7 – Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.10 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 2: DNA Technologies | Total Learning Hours for Unit: 30

Unit Summary: This unit will include instruction in Diving into DNA and Genetic Transformers
Competencies include:

2.1 DNA is extracted from cellular matter to be studied.
2.2 Restriction enzymes are used to cut DNA in order to compare organisms, isolate and transfer genes, and genetically modify organisms.
2.3 DNA profiles are created using fragments produced through Restriction Fragment Length Polymorphism.
2.4 Transformation is used to synthetically produce proteins for increased animal and plant production.
2.5 Plasmids are used to insert the genes for desired traits into bacterial cells.
2.6 Proteins of interest can be purified from bacterial cultures for further study.
2.7 Conducting background research is important to identify what is already known about the research objective.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Write an experiment to extract DNA from kiwi fruit.
- Extract DNA from kiwi fruit using procedures developed.
- Mix solutions and pour gel trays to prepare agarose gels.
- Conduct gel electrophoresis to observe the migration of dyes and extracted DNA.
- Demonstrate the action of restriction enzymes using paper DNA strands.
- Digest a DNA sample using restriction enzymes and conduct gel electrophoresis to analyze the results.
- Solve a problem determining the culprit of a crime using restriction enzymes and gel electrophoresis.
- Prepare agar plates and LB broth for experiments.
- Transform bacterial cells to exhibit ampicillin resistance and bioluminescence.
- Use the pGLO plasmid to transform bacterial cells to exhibit desired traits
- Research how the Ti plasmid is used to transform a bacteria of interest for agricultural biotechnology applications
- Culture transformed cells and purify a protein of interest from the bacteria
- Research *Agrobacterium tumefaciens* to determine applications in the agricultural field.
- Write a scientific research paper using valid resources and parenthetical citations.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.

- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will work creatively with others, and reason effectively to complete DNA extraction experiments
Students will access and evaluate information and use and manage information to complete research on Agrobacterium tumefaciens

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards – Biotechnology Systems Pathway
CRP 04: Communicate clearly, effectively and with reason.
CRP.04.02: Produce clear, reasoned and coherent written and visual communication in formal and informal settings.
CRP. 07:Employ valid and reliable research strategies.
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.
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.02.02: Implement standard operating procedures for the proper maintenance, use and sterilization of equipment in a laboratory.
BS.02.03: Apply standard operating procedures for the safe handling of biological and chemical materials in a laboratory.
BS.02.04: Safely manage and dispose of biological materials, chemicals and wastes according to standard operating procedures.
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.03.01: Apply biotechnology principles, techniques and processes to create transgenic species through genetic engineering.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):
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.
HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
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 trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Obtaining, Evaluating, and Communicating Information	**LS1.A Structure and Function**	**Patterns**
Constructing Explanations and Designing Solutions	**LS3. A Inheritance of Traits**	**Cause and Effect: Mechanism and Prediction**
Asking Questions and Defining Problems	**LS4.A Evidence of Common Ancestry and Diversity**	**Scale, Proportion, and Quantity**
Planning and Carrying Out Investigations	**ETS1. A Defining and Delimiting Engineering Problems**	**Systems and Systems Models**
	ETS1.B Developing Possible Solutions	

Washington English Language Arts Standards (Common Core State Standards)
CCSS: English Language Arts Standards- Science and Technical Subjects
RST.11-12.2 – Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.4 – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.10 – By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
WHST.11-12.2 – Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
WHST.11-12.4 – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5 – Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 – Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
WHST.11-12.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

WHST.11-12.8 – Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9 – Draw evidence from informational texts to support analysis, reflection, and research.
WHST.11-12.10 – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences

Unit 3: Proteins	Total Learning Hours for Unit: 30

Unit Summary: Instruction will include Protein Processes
Competencies include:
3.1 Transcription and translation are processes that produce proteins of which all living things are made.
3.2 Colorimetric assays can be used to identify and determine the amount of protein in a biological sample extract.
3.3 The presence of specific proteins in a biological sample can indicate the presence of disease, exposure to disease, or identify genetically modified product.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Research the processes of transcription and translation and complete a simulation of amino acid production.
- Perform an experiment using a spectrophotometer to assess the protein content of milk and other high protein drinks.
- Compare the results of Bradford assays to Biuret assays.
- Complete an enzyme-linked immunosorbent assay to determine the presence of protein.
- Write an outline of their research paper on *Agrobacterium tumefaciens*.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will apply technology effectively when performing experiments using the spectrophotometer
Students will work independently to create their research paper outline

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards – Biotechnology Systems Pathway:
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.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.
BS.03.04: Apply biotechnology principles, techniques and processes to enhance plant and animal care and production (e.g., selective breeding, pharmaceuticals, biodiversity, etc.).

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):
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.
HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

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.
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.
HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Developing and Using Models	LS1.A Structure and Function	Patterns
Analyzing and Interpreting Data	LS1.C Organization for Matter and Energy Flow in Organisms	Scale, Proportion, and Quantity
Using Mathematics and Computational Thinking	LS3.A Inheritance of Traits	
Obtaining, Evaluating, and Communicating Information		

Washington English Language Arts Standards (Common Core State Standards)
RST.11-12.1 – Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.2 – Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.4 – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.10 – By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

WHST.11-12.2 – Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
WHST.11-12.4 – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5 – Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 – Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
WHST.11-12.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8 – Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9 – Draw evidence from informational texts to support analysis, reflection, and research.
WHST.11-12.10 – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 4: Agricultural Biotechnology	Total Learning Hours for Unit: 60

Unit Summary: This unit will include instruction in; Genetically Modified Organisms, Performance Enhanced Plants, Animal Applications, and Everyday Biotechnology
Competencies include:

4.1 Ethical and moral questions arise from the science of genetically modifying organisms.
4.2 Genetic testing, such as polymerase chain reactions and lateral flow tests, is used to make production based decisions and identify genetically modified organisms.
4.3 Organisms are genetically modified to improve agricultural products by inserting genes into cells.
4.4 Plants are genetically modified to improve agricultural products by inserting genes into cells.
4.5 The totipotency of plants allows a minute portion of tissue to be cultured into a complete plant.
4.6 A sterile environment, including media, work area, equipment, and lab technician is required to produce viable plants by micropropagation.
4.7 Deoxyribonucleic acid (DNA) can be cut, replicated, and inserted into the genome of an organism for the improvement of agricultural production.
4.8 The immune response of mammals can be used to detect proteins of interest.
4.9 Animal reproductive technologies are used by producers in order to achieve management goals.
4.10 Markers are used to identify the successful insertion of genes.
4.11 Genetic testing and disease diagnosis are used to make production based decisions.
4.12 Biotechnological practices, such as bioremediation, use naturally occurring processes to provide industrial applications.
4.13 Biofuels are a source of renewable energy derived from organisms.
4.14 Fermentation and esterification are processes in which agricultural products are converted into biofuels.
4.14 The precautionary principle serves as a guiding statement for determining the ethical considerations of biotechnology and other scientific endeavors.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Reflect upon the term genetically modified and develop personal perceptions and beliefs pertaining to the term.
- Research published perceptions of genetically modified organisms of different groups and organizations and discuss in class.
- Perform a lateral flow test to determine the presence of Round-Up Ready® genes in corn.
- Conduct a polymerase chain reaction to determine the presence of genetic modifications in a common food item.
- Conduct a public perception survey of genetically modified foods.
- Complete the annotated bibliography, the rough draft, and a peer review of the *A. tumefaciens* research paper.
- Research and compare methods of inserting genes into plants and discuss the advantages and disadvantages of each.
- Propagate African violets using tissue culture.
- Sanitize, sterilize, and maintain an aseptic environment to promote success during tissue culture.
- Complete a simulation of the process for developing transgenic plants.
- Develop and write a protocol to insert a gene of interest in plants.
- Perform enzyme-linked immunosorbent assays to detect the immunological response of animals.
- Research and present their findings on reproductive technologies used in animal agriculture.
- Perform PCR and electrophoresis to use marker assisted selection to determine ideal genotypes for specific situations.
- Complete a WebQuest to study the diagnostic tools available for detection of diseases and genetic abnormalities.
- Design and conduct an experiment determining the effectiveness of oil-eating microbes in various environmental conditions.

- Research a type of biofuel and determine a method of producing the fuel in a laboratory.
- Review a case study and interpret the application of the precautionary principle by interest groups.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will interact effectively with others while propagating African violets
Students will work effectively in diverse teams while completing a WebQuest for detection of diseases and genetic abnormalities
Students will produce results and be responsible to others while performing enzyme linked immunosorbent assays

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards – Biotechnology Systems Pathway

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.05: Consider the environmental, social, and economic impacts of decisions.
CRP.05.01: Assess, identify and synthesize the information and resources needed to make decisions that positively impact the workplace and community.
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.06.02: 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.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: Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.08.01: Apply reason and logic to evaluate workplace and community situations from multiple perspectives.
BS.01: Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., historical events, societal trends, ethical and legal implications, etc.).
BS.01.01: Investigate and explain the relationship between past, current and emerging applications of biotechnology in agriculture (e.g., major innovators, historical developments, potential applications of biotechnology, etc.).
BS.01.02: Evaluate the scope and implications of regulatory agencies on applications of biotechnology in agriculture and protection of public interests (e.g., health, safety, environmental issues, etc.).
BS.01.03: Analyze the relationship and implications of bioethics, laws and public perceptions on applications of biotechnology in agriculture (e.g., ethical, legal, social, cultural issues).
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.02.01: Read, document, evaluate and secure accurate laboratory records of experimental protocols, observations and results.
BS.02.02: Implement standard operating procedures for the proper maintenance, use and sterilization of equipment in a laboratory.
BS.02.04: Safely manage and dispose of biological materials, chemicals and wastes according to standard operating procedures.
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.03.01: Apply biotechnology principles, techniques and processes to create transgenic species through genetic engineering.

BS.03.03: Apply biotechnology principles, techniques and processes to protect the environment and maximize use of natural resources (e.g., biomass, bioprospecting, industrial biotechnology, etc.).
BS.03.04: Apply biotechnology principles, techniques and processes to enhance plant and animal care and production (e.g., selective breeding, pharmaceuticals, biodiversity, etc.).
BS.03.05: Apply biotechnology principles, techniques and processes to produce biofuels (e.g., fermentation, transesterification, methanogenesis, etc.).
BS.03.06: Apply biotechnology principles, techniques and processes to improve waste management (e.g., genetically modified organisms, bioremediation, etc.).

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):
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.
HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
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.
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
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-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
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-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Asking Questions and Defining Problems	LS1.A Structure and Function	Structure and Function
Analyzing and Interpreting Data	LS4.C Adaptation	Stability and Change
Constructing Explanations and Designing Solutions	LS1.B Growth and Development of Organisms	Cause and Effect: Mechanism and Prediction
Engaging in Argument from Evidence	LS1.C Organization for Matter and Energy Flow in Organisms	Systems and System Models
Obtaining, Evaluating, and Communicating Information	LS4.D Biodiversity and Humans	
Developing and Using Models	ESS3.A Natural Resources	
Planning and Carrying Out Investigations	ESS3.C Human Impacts on Earth Systems	
	ETS 1A ETS 1B	

Washington English Language Arts Standards (Common Core State Standards) –

RST.11-12.1 – Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.3 – Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
RST.11-12.4 – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.7 – Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.8 – Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
RST.11-12.10 – By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

WHST.11-12.2 – Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
WHST.11-12.4 – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5 – Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 – Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
WHST.11-12.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8 – Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9 – Draw evidence from informational texts to support analysis, reflection, and research.
WHST.11-12.10 – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 5: Research Methods	Total Learning Hours for Unit: 30

Unit Summary: This unit will include instruction in Independent Researchers and From Lab to Production
Competencies include:

5.1 Research is driven by questions and backed by literature reviews, experimentation, and communication of results.
5.2 Conducting background research is important to identify what is known about the research question.
5.3 Experiments are designed in such a way that the control is apparent and the researcher can conduct multiple trials.
5.4 Results of research experiments include interpretation of data in the form of posters, papers, or oral presentations.
5.5 The genome of multiple organisms can be analyzed in order to understand genetic variations.
5.6 Regulatory agencies monitor research and development, production, and use of biotech products in order to ensure safety for consumers and the environment.
5.7 Results of research undergo multiple steps and trials before researching consumers.
5.8 Ethical questions surrounding applications of biotechnology, which generate discussions and varying opinions, are based on personal feelings and beliefs.
5.9 Biotechnology is a fast growing industry with many emerging technologies and future career opportunities.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:

- Brainstorm ideas for research projects and define a problem to solve in order to frame research.
- Collect and summarize similar research conclusions.
- Write a research proposal outlining the background and need for their research as well as a plan for conducting the research.
- Conduct a self-designed research project and collect data for results and analysis.
- Write a research paper summarizing the findings of their research.
- Prepare a research poster to present to the class and at local science fairs.
- Use web-based resources to find information on the genetic sequence of a protein.
- Determine the influence of governmental regulatory agencies.
- Write a case study pertaining to a biotechnological application and the role of governmental agencies in determining the safety of the application.
- Develop a model depicting the steps from laboratory research through production to end use of a biotechnology.
- Review their ethical perspectives of biotechnological practices and reflect on how their opinions have developed over the length of the course.
- Write a letter outlining their vision for future biotechnological innovations and practices.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will manage projects, produce results, and manage goals and time while self-monitoring completion of their research projects.
Students will work independently on self-designed research project.
Students will communicate clearly to complete project presentations.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards – Biotechnology Systems Pathway:

CRP.01.01: Model personal responsibility in the workplace and community.
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.05.01: Assess, identify and synthesize the information and resources needed to make decisions that positively impact the workplace and community.
CRP.06.01: Synthesize information, knowledge and experience to generate original ideas and challenge assumptions in the workplace and community.
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.09.02: Implement personal management skills to function effectively and efficiently in the workplace (e.g., time management, planning, prioritizing, etc.).
CRP.12.01: Contribute to team-oriented projects and build consensus to accomplish results using cultural global competence in the workplace and community.
CRP.12.02: Create and implement strategies to engage team members to work toward team and organizational goals in a variety of workplace and community situations (e.g., meetings, presentations, etc.).
BS.01: Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., historical events, societal trends, ethical and legal implications, etc.).
BS.01.01: Investigate and explain the relationship between past, current and emerging applications of biotechnology in agriculture (e.g., major innovators, historical developments, potential applications of biotechnology, etc.).
BS.01.02: Evaluate the scope and implications of regulatory agencies on applications of biotechnology in agriculture and protection of public interests (e.g., health, safety, environmental issues, etc.).
BS.01.03: Analyze the relationship and implications of bioethics, laws and public perceptions on applications of biotechnology in agriculture (e.g., ethical, legal, social, cultural issues).
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.02.01: Read, document, evaluate and secure accurate laboratory records of experimental protocols, observations and results.
BS.02.02: Implement standard operating procedures for the proper maintenance, use and sterilization of equipment in a laboratory.
BS.02.03: Apply standard operating procedures for the safe handling of biological and chemical materials in a laboratory.
BS.02.04: Safely manage and dispose of biological materials, chemicals and wastes according to standard operating procedures.

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):
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 trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Specific Project Title(s): MUST BE ADDED AT LOCAL LEVEL

Science and Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
Obtaining, Evaluating, and Communicating Information	ETS1.B Developing Possible Solutions	Systems and System Models
Engaging in Argument from Evidence	ETS1. A Defining and Delimiting Engineering Problems	
Constructing Explanations and Designing Solutions		
Analyzing and Interpreting Data		
Developing and Using Models		
Asking Questions and Defining Problems		
Planning and Carrying Out Investigations		

Washington English Language Arts Standards (Common Core State Standards) –

RST.11-12.1 – Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
RST.11-12.2 – Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
RST.11-12.4 – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
RST.11-12.7 – Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
RST.11-12.8 – Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
RST.11-12.10 – By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

WHST.11-12.2 – Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
WHST.11-12.4 – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.11-12.5 – Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.11-12.6 – Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
WHST.11-12.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
WHST.11-12.8 – Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9 – Draw evidence from informational texts to support analysis, reflection, and research.
WHST.11-12.10 – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Unit 6: Career Leadership, Communication, and Documents	Total Learning Hours for Unit: 10

Unit Summary:
Competencies include:

- Participate in a job interview.
- Produce a well-written cover letter, job application, and follow-up letter.
- Follow oral and written directions with understanding; form questions that clarify directions as needed.
- Communicate effectively in oral, written, visual and nonverbal modes.
- Recognize and demonstrate reflective listening skills and assertive communications skills in the workplace.
- Identify acceptable work habits and personal characteristics.
- Demonstrate knowledge of the opportunities for leadership development available through an appropriate student organization.

Performance Assessments:
Performance assessments on the following topics may be developed at the local level. In order to earn approval at the state level, performance assessments must be submitted within this framework.

It is expected that students will:
Students will explore the role of leadership in agricultural careers through research and discussions. Identify what is good communication in both written and verbal form within agricultural careers and develop documentation that allows them to most effectively reach specific audiences for particular purposes.

Leadership Alignment:

- Leadership activities should include 21st Century Skills embedded in curriculum and instruction for this unit of instruction. Include leadership skills that are being taught and assessed within the class for all students.
- The event, activity, or project and the associated 21st Century Skill should be clearly articulated.
  Example: Students will demonstrate the ability to communicate clearly through their group project presentation.

Students will be self-directed learners, work independently, and communicate clearly by participating in a job interview. Students will make judgments and decisions to recognize and demonstrate reflective listening skills and assertive communications skills, and will be responsible to others and reason effectively to identify work habits. Students will create media products and communicate clearly by producing a well-written cover letter, job application, and follow-up letter.

Industry Standards and Competencies

Agriculture, Food, and Natural Resources (AFNR) Standards - Life Knowledge and Career Cluster Skills:
CS.01.03. Performance Indicator: Vision: Establish a clear image of what the future should look like.
CS.01.05. Performance Indicator: Awareness: Desire purposeful understanding related to professional and personal activities.
CS.02.03. Performance Indicator: Professional Growth: Develop awareness and apply skills necessary for achieving career success.

CS.03.01. Performance Indicator: Communication: Demonstrate oral, written and verbal skills.

Level II: CS.03.01.01.b. Select the appropriate form of technical and business writing or communication for a specific situation.

Level II: CS.03.01.02.b. Prepare a resume.

Level II: CS.03.01.03.b. Deliver a business presentation for a peer group (e.g., class presentation).

Aligned Washington State Standards

Washington Science Standards (Next Generation Science Standards):

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.

Washington English Language Arts Standards (Common Core State Standards) - Science and Technology Writing Standards (Grades 9-10):

WHST.9-10.1D Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

WHST.9-10.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

21st Century Skills

Students will demonstrate in this course:

LEARNING & INNOVATION

Creativity and Innovation
- ☐ Think Creatively
- ☒ Work Creatively with Others
- ☐ Implement Innovations

Critical Thinking and Problem Solving
- ☒ Reason Effectively
- ☐ Use Systems Thinking
- ☒ Make Judgments and Decisions
- ☐ Solve Problems

Communication and Collaboration
- ☒ Communicate Clearly
- ☒ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS

Information Literacy
- ☒ Access and Evaluate Information
- ☒ Use and Manage Information

Media Literacy
- ☐ Analyze Media
- ☒ Create Media Products

Information, Communications and Technology (ICT Literacy)
- ☒ Apply Technology Effectively

LIFE & CAREER SKILLS

Flexibility and Adaptability
- ☐ Adapt to Change
- ☐ Be Flexible

Initiative and Self-Direction
- ☐ Manage Goals and Time
- ☒ Work Independently
- ☒ Be Self-Directed Learners

Social and Cross-Cultural
- ☒ Interact Effectively with Others
- ☒ Work Effectively in Diverse Teams

Productivity and Accountability
- ☒ Manage Projects
- ☒ Produce Results

Leadership and Responsibility
- ☐ Guide and Lead Others
- ☒ Be Responsible to Others