# AGED 539 Graduate Internship in Agriculture Education

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# AGED 539 Project

My project for AGED 539 was to assist in writing the curriculum and implement the new UCCI Agriculture and Soil Chemistry course at Central Valley High School.
Steps needed to complete this project:

1. Research course outline
2. Discuss course with site administration for approval to implement
3. Discuss course with advisory committee
4. Attend Skills course on UCCI curriculum
5. Attend UCCI Teacher Exchange Institute
6. Implement and adjust curriculum in the Ag Chemistry class for the 2015-2016 school year.
7. Proposal course name change and apply for UC/CSU course approval

Step 1- Research Course Outline

I developed the course for Ag Chemistry in 2012 because our agriculture department was losing students during the sophomore year. Ag Chemistry allowed them to continue to stay enrolled and progressing in agriculture classes and FFA. Technical knowledge of chemistry was a personal weakness; therefore a professional partnership was developed between Megan Uhrich, our general education chemistry teacher and I. General chemistry and ag chemistry curriculum were aligned and paced identically which limited the opportunities for hands on agriculture application within the course. Required common formative and summative assessments limited the freedom to vary from group pacing.
In the fall of 2014, the California Agricultural Teachers Association released curriculum framework developed as part of the 2030 project for 3 courses in an Agriscience Pathway. The courses were UC/CSU approved for lab science credit, Common Core standards aligned, and NGSS aligned. It was determined through a department discussion that this curriculum would benefit our students and our agriculture department. Implementation of these courses and their curriculum would increase the hands on, directly agricultural component of our courses in the Agriscience Pathway.

Step 2- Discuss with Administration

After discussing the courses as a department, I met with Amy Peterman, our then-principal, and Paul Rutishauser, our then-vice principal. We discussed the pros and cons of implementing the new curriculum. Both appreciated the amount of writing and advanced writing required as well as the NGSS and Common Core alignment. When the question was posed regarding deviating from common curriculum as well as common formative and summative assessments, administration was not opposed to our separation.

Step 3- Discuss course with Advisory Committee

Our advisory committee was very supportive of the move to application chemistry, especially the focus on Soil Chemistry. Dave Brown supplied multiple contacts through Stanislaus Farm

Supply as a source of class speakers and to supply materials for labs. The committee provided unanimous support for the course change.
Step 4- Attend Skills Course on UCCI curriculum

On June 25th, I participated in the UCCI Skills Course at the California Agricultural Teacher's Association Summer Conference. The course was focused on dissecting the "key assignments" for the UCCI courses and developing functional summative assessments for each assignment. Teachers were grouped based on experience and interest. I participated in the Ag and Soil Chemistry group working specifically on Unit One key assignments. My responsibility was to develop key assignment 2, The Soil and Water Management Mini Lab. It was valuable to team with other teachers and be able to collaborate on a common cause. It was determined that the best way allow access and collaboration universally was to develop a Google Drive to store and organize the entire developed curriculum. During the workshop, teachers were invited to the summer UCCI training at Pleasant Grove High School on August 3rd and 4th.

Step 5- Attend UCCI Teacher Exchange Institute

The next significant step in preparing for the course was to develop a pacing guide and collect lesson resources for all teachers throughout California to use. During the UCCI Teacher Exchange, I worked closely with teachers from all over California to pace out each unit using existing and developed curriculum. I assisted specifically with Unit 4- Plants and Soil Management, for which we also had to develop the summative assessments for each key assignment. In addition to the developing the key assignments as a group, Melissa Ruble, Stephanie Goeb, Amy Guerra and myself provided existing and developed lessons and activities to support each key assignment. The 2 day institute encouraged in depth study of the course as well as a team effort to develop the pacing for each unit. I was able to take the work from this institute and apply it to a specific planning guide for Central Valley High School.

Step 6- Implement Curriculum

The Ag and Soil Chemistry course has been very successful in terms of student engagement and student autonomy. From day one, the relevance of the course and interest in career application was evident. Students were also better prepared this year to develop their own ag science research project. I have been teaching students to design and execute ag research experiments for 7 years now and this has been the best success in student participation so far. Some contributing factors linked to the curriculum could be the "mini-labs" as a central focus during Unit 1. Each of these labs are designed to encourage student exploration of possible agriculture topics to study for their project. It also allowed me to scaffold parts of the experiment without being concerned about concept development. The goal and purpose of the "mini-labs" is teach scientific method, not the soil or chemistry process, even though those concepts are researched during the activity. Unrelated factors contributing to the success could be that all students at Central Valley High School were provided a personal Chromebook to use, as well as a school-wide implementation of Google Classroom. These allow for easier access to information and better organization for students.
Some struggles with the collaborative curriculum and pacing were inevitable but the Google Group established a forum to pose questions and assist others with questions. It was discovered

early that lessons and pacing needed to be adjusted to allow students enough time to experience success. Also, in my specific situation our greenhouse facilities are a 10 minute walk from the chemistry classroom so labs take much longer if supplies must be kept outdoors. Also, for soil tests a La Motte Model EL kit is utilized and the tests, though highly accurate, are time consuming and have detailed steps. This uses a lot of class time during 55 minute class periods. A log of successes and adjustments is being kept to assist in developing pacing for next years classes.

Step 7- Propose course at site steering committee meeting and apply for UC/CSU approval

At the November 9th steering committee meeting, the agriculture department proposed 4 courses: Sustainable Agriculture, Agriculture and Soil Chemistry, Agriculture Systems Management, and Food Science as part of a comprehensive Ag Science pathway.

# UCCI Course: Agriculture and Soil Chemistry

**Course Overview**

This course explores the physical and chemical nature of soil as well as the relationships between soil, plants, animals and agricultural practices. Students will examine properties of soil and land and their connections to plant and animal production. Using knowledge of scientific protocols as well as course content, students will develop an Agriscience research program to be conducted throughout the first semester of the course.To complete that whole project each student will investigate and test an Agriscience research question by formulating a scientific question related to the course content, formulating a hypothesis based on related research, conducting an experiment to test the hypothesis, collecting quantitative data, and forming a conclusion based on analysis of the data. The result of this research program will be an in depth research and experimentation paper that is technically written, based on scientific protocol, and cited using APA formatting. Additionally, students will develop and present a capstone soil management plan for agricultural producers, using the content learned throughout the course. Throughout the course, students will be graded on participation in intracurricular FFA activities as well as the development and maintenance of an ongoing Supervised Agricultural Experience (SAE) program.

**Academic Subject:** **Lab Science**

**Select One:** **Life Science (Biology)**
**Chemistry**
**Physics**
**Interdiscplinary**

**CTE Sector and Pathway: Agriculture and Natural Resources | Agriscience**

**Course Content:**

**<u>For each unit</u> please provide the following information:**

**1) <u>Description of topics:</u> describe the topics and skills students learn in the unit. Focus on describing the actual work of the course and not the content standards the course aligns with.**

**2) <u>Assignment summaries</u>: Describe each major assignment that makes up the "identity" of the unit: What do students produce to demonstrate learning? What are the major parameters of that work and what purpose does it serve?**

**Unit One:**

**Agriscience Practices**

**Unit Description**

This introductory unit will focus on proper methods of agriscience inquiry. Through a series of mini-lab experiences based on the course content, students will learn to ask questions and define problems, conduct research to form a hypothesis, determine the experimental design and conduct experimentation, analyze and interpret data, develop conclusions and then communicate their findings in lab reports. Not only will the students learn to utilize proper scientific method protocol through conducting these mini-labs, they will also learn what topics will be taught throughout the year in order to guide them in selecting the problem/question for their individual Agriscience Project. Through these mini-lab experiences and unit content, students will be provided with the skills and knowledge to successfully establish the idea they will pursue in their Agriscience Project. By the end of this unit, students will complete the Agriscience Project Research Proposal for their on-going science experiment that will be conducted throughout the first semester of the course.

**Key Assignments**

**1. Soil Structure and Composition Mini-Lab - Calgon Testing**

Students will learn that soil is composed of different size particles at varying percentages by conducting an experiment where students separate, examine and identify the major components of soil to better understand how these components give soil its unique physical characteristics. Students will learn to measure the percentage of sand, silt, and clay in a soil sample. Soil samples should be collected in the course of a walking field trip where students will take samples from varying locations on the walk. Students will mix one cup of soil sample with laundry detergent powder in a mason jar in order to dissolve the soil aggregates and keep the individual particles separated. Once the soil sample mixture sits for three days, students will measure and determine the percentage of each particle within their specific soil sample. Students will write a lab report to summarize what occurred throughout the experiment, their data, and analysis/conclusion.

**2.Water and Soil Management Mini-Lab - Water Percolation**

Students will learn how to design a scientific experiment through proper scientific method and how to develop a research proposal. Students will be put into groups to produce a mini-proposal which will include the specific water percolation problem/question they will research for this lab, three literary research references, a hypothesis and scientific procedure. Students will also learn how soil composition impacts the speed of water percolation or amount of water absorption by conducting the experiment they designed. Students will create a lab report that includes their data and analysis/conclusion. The lab not only develops students ability to write a proposal and a scientific experiment, but exposes them to the relationship between water and soil management.

**3. Plant and Soil Management Mini-Lab - Nutrient Uptake**

Students will learn that plants utilize nutrients in soil to grow and develop. Each student will bring in a soil sample from their yard to utilize in this lab. They will divide the sample into two pots, one that will be a control sample and the other will be amended with animal manure compost. They will test the nutrients of these two pots of soil with a standard soil testing kit in order to record the levels of Nitrogen, Phosphorus, and Potassium in their control and amended samples. A bean seed will be planted in each pot of soil to germinate and grow over the course of a two week period. Throughout the two weeks, students will be recording quantitative data on seed germination, plant growth, and soil nutrients. After analyzing their data, students will determine how much of each nutrient was utilized by the bean plant. A lab report will be written to summarize what occurred throughout the experiment, their data, and analysis/conclusion.

**4. Animal and Soil Management Mini-Lab - Animal Manure Amendment**
To build on to the learning of nutrient uptake in the previous lab, students will extend their data analysis to make conclusions on why the bean plant in the amended soil sample had more optimal growth over the past two weeks than the bean plant in the controlled soil sample. This extended analysis of their data will allow the students to learn that animal waste can be composted and used as a soil amendment to increase soil nutrients for optimal plant growth. A lab report will be written to summarize what occurred throughout the experiment, their data, and analysis/conclusion.

**5. Technology Mini-Lab - Soil Moisture Testing**
Building on the learning of soil composition in the Calgon lab, in this mini-lab, students will learn that the moisture levels in soil vary depending on the soil composition through the use of soil moisture sensing equipment. Students will learn how to operate a soil moisture sensor by testing the moisture levels in various soils. Students will return to the locations where soil samples were collected for the Calgon testing lab in order to test the moisture levels of those specific soils. They will use their data from the Calgon testing lab alongside the data from the soil moisture tests to determine how the composition of the soil impacts the soil moisture levels. A lab report will be written to summarize what occurred throughout the experiment, their data, and analysis/conclusion.

**6. Agriscience Research Project Proposal**
The key assignment for this introductory unit will be writing a research proposal for the student's planned Agriscience Project. To guide the students in deciding their agriscience research questions/problem, the mini lab experiences completed in this unit should be utilized.The written proposal will include their chosen problem/question that they will be researching and investigating, five pieces of literary references, and the steps to complete for their research project. This assignment marks the first in a series of assignments that will be necessary for students to complete in order to successfully complete their agriscience research project.

**Unit Two:**

**The Nature of Soil**

**<u>Unit Description</u>**
Students will use the methods of scientific inquiry, developed in the previous unit, to

investigate the composition of the physical world, and discover how matter and energy change forms through biogeochemical cycles. Students will understand where soil originates by investigating the role of the rock cycle in soil formation. Students will learn how the electron configurations of different elements, present in the parent material, give them unique physical and chemical properties, and will further investigate how these properties impact soil characteristics. Students will identify how the climate, weather, and environment impact the soil properties, and will examine the role erosion plays in soil science. Students will collect soil samples from a variety of sources, and will use industry methods to determine the chemical composition of the soil and how this composition affects its physical and chemical characteristics. Students will connect to prior knowledge of life science by looking at how biotic factors impact soil type, composition and texture through investigation and experimentation. Students will use the results of their soil testing and the locations from which they took their samples to create a soil map of their local area. Students will compare their map to existing soil maps and analyses, and analyze the similarities and differences with the previous research.

**Key Assignments**

**1. Sedimentary Rock Lab**

In this activity students will model how sedimentary rock is formed by simulating weathering and erosion. Because sedimentary rock is the parent material for major components of many high quality soils, students will investigate the physical and chemical processes which create sedimentary rock. In this lab, students will use brown sugar to simulate the effect of water on soluble rock, show how water can dissolve various minerals, show how freezing water can crack porous rock, show the effects of water's impact by pouring water on sand, and use a hairdryer and sand to simulate wind erosion on copper sulfate crystals. Students will turn in a lab report that details the results of the lab and that identifies which processes are examples of physical change (water expanding in cracks to break rocks, sand particles wearing away rock, etc.), and which processes are examples of chemical change (slightly acidic water dissolving limestone, oxidation of minerals to create metal oxides, etc.).

(http://www.rsc.org/education/teachers/resources/jesei/weather/home.htm)

**2. Collect and Test Soil Samples: Physical Properties (figure out what elements might be in them based on chemical properties)**

In this lab, students will learn how to test the physical characteristics of soil, so that they can learn how these characteristics affect a soil's capabilities in later units. They will be able to assess and amend a soil to achieve a specific agricultural application. Students will collect soil samples from a variety of locations around their community. After receiving instruction in lab safety protocols, students will choose appropriate lab testing and safety equipment, and will carry out a battery of industry standard tests to determine what physical characteristics the soil samples possess. After receiving instruction in what physical properties of matter are measured in soil testing, students will use the ribbon test, and also look at physical factors such as soil texture, composition, and particle size. Students will examine the soil for presence of living organisms, such as nematodes. Based on these properties, students will hypothesize what chemical elements are present in the soil. Students will research what chemicals are prominent in the soil in their test areas, and check their hypotheses against this research. Students will turn in an annotated bibliography detailing the major findings of their research. Students will give a presentation on their annotated bibliography, and give details on where their soil came from, the lab tests they performed, the results of the tests, their data analysis, and how that analysis compared to their research.

**3. Background Scholarly Research and Forming a Hypothesis**
As they begin work on their semester-long research project, students use skills in research and forming hypotheses developed in the previous units to develop a hypothesis for their agriscience research project. Students will use credible sources to conduct background research on the agricultural issue they are investigating by reading and deconstructing scholarly journal articles to identify the key components of their agriscience research project. They will use this research to generate a testable hypothesis related to the scientific problem they have identified. The hypothesis developed by the student will be constructed with the independent and dependent variables in mind, and ultimately reviewed by the instructor.

**4. Test Soil Samples: Chemical Properties**
In this lab, students will learn how to test the chemical characteristics of soil, so that as they learn how these characteristics affect a soil's capabilities in later units, they will be able to assess and amend soil to achieve a specific agricultural application. Students will test the soil samples that they collected for the previous lab to determine the chemical properties of the samples. After receiving instruction in lab safety protocols, students will choose appropriate lab testing and safety equipment. After learning what chemical characteristics of soil are commonly tested, what reactions occur in the testing process, and how these tests are performed, students will carry out a battery of industry standard tests to determine chemical characteristics, such as pH, nitrogen levels, potassium levels, phosphorous levels and presence of micronutrients. Students will use their chemical tests to compare what chemical elements they found in the soil with what they hypothesized based on physical characteristics, and what they found in their research. Students will turn in a lab report which details where their soil came from, the lab tests they performed, the results of their tests, and the analysis of their results as compared to their findings in the previous assignment.

**5. Experimental Design and Conducting Experimentation**
Students continue work on their semester-long agriscience project by constructing an experimental design to test the hypothesis they developed in earlier in this unit. A written experimental design should be constructed consistent with scientific protocols using the systematic approach outlined in the previous units. Students will have their experimental designs reviewed by professional contacts (industry experts, agricultural instructors, local growers/producers, researchers or university representatives). After validating the design using the peer review process, students will move to the experimentation phase of their research. Experimental designs should include replicates, control groups, and determine the variables to be controlled and how. Additionally, a determination should be made as to the type of data that will be collected and in what ways, with the emphasis placed on quantitative data or quantifying data that is qualitative in nature. Students will use their experimental design to test their hypothesis. Raw data should be recorded using a field book or electronic device.

**6. Creating Soil Maps**
Students will take the soil analysis results from the previous assignments to construct a soil map of their local area. Based on the physical properties, such as soil texture, composition and particle size, the chemical properties, such as pH, nitrogen levels, micronutrient levels, etc., and the specific location from which the soils came, students will categorize the soil samples and the class will construct a comprehensive soil map of the local area. Students will then compare their map to existing soil maps, and analyze the similarities and differences with the previous USDA-NRCS maps.

**7. Soil Management Project**
The soil management project, which students begin in unit 2, will be ongoing throughout the length of the course. The teacher will procure samples of soil from a variety of local farms and these samples will be kept as individual soil plots, or can be kept in plastic containers. Students will perform a variety of tests on these soil samples throughout the course in order to determine the characteristics that the individual samples possess, to analyze how these characteristics impact agricultural outcomes, and how amendments can be made to the soil samples in order to achieve a desired outcome. In this unit students will use the skills they learned in the previous labs to test and record the physical and chemical characteristics of the soil, and identify organisms living in the soil. Students will keep ongoing records of the data they collect during each of the units learning labs. This data will include information about the physical and chemical characteristics of their soil sample, results from testing pH, moisture, nutrient levels, water holding capacity, ability to grow target crops, and other factors in subsequent units.

**Unit Three:**

**Water and Soil Management**
**<u>Unit Description</u>**
Using knowledge accessed from previous units on the physical and chemical properties of soil, students will analyze how the water cycle impacts soil based on its soil type (sand, silt, clay) soil location (geographic and topographic), vegetative state and natural slope of land. In order to understand how water becomes available for plant growth, students will explain the movement of water through soil with respect to how intermolecular forces impact percolation, capillary action, pore size, cohesion and adhesion. Furthermore, students will address how the concentration of organic matter in soil impacts the movement of water. Students will explain the impact that soil has on the quality of their water and will use water analysis tests to determine the safe and appropriate levels for potable water. Students will also be able to provide solutions to possible contaminations and/or toxic levels of residues/nutrients in the water samples. Students will determine how different irrigation, tillage and planting practices will impact the soil and surrounding area by testing water quality, pH and checking for possible contaminants due to leaching. Students will determine proper and efficient irrigation practices based on the chemistry behind the soil and the way water moves through the soil particles. Students will use GPS to enable students to more accurately analyze watersheds in their area and rationalize how the drought can impact both water quality and quantity as well as soil composition.

**Key Assignments**

**1. Soil Erosion and Runoff Lab**

Using soil plots from the previous labs, students will analyze how soils with vegetation (including organic matter) have a greater water holding capacity and less runoff than soils without vegetation by collecting runoff water from each plot and testing not only the amount of water collected from each plot, but also the percent of solids collected from runoff from each of those plots. Students will complete their lab write up to emphasize their understanding of these key concepts. Students' lab reports should include qualitative and quantitative observations of the composition of runoff from the soil plots. They should analyze this data to draw conclusions about the water holding capacity of the soils and should discuss the intermolecular interactions which allow soil to hold water at the molecular level. This assignment prepares them for decisions that will be made in their capstone project of creating a soil management plan.

**2.Water Quality Testing**

Students will begin by examining properties of subatomic particles and will create models to illustrate bonding of hydrogen and oxygen, accounting for the polarity of the water molecule. The focus of this unit will continue to develop an understanding of how hydrogen bonds give water a number of properties that allow it to percolate through soil, adhere to pollutants and transpire through plants.

https://www.lcmm.org/education/resource/on-water-ecology/worksheet-water-quality-testing.pdf

Above is the link to the lab where students will test water samples from various sources throughout their community to determine the quality of the water. They will test and record data on pH, phosphates, nitrates, dissolved oxygen, and turbidity. Students will then analyze this data to draw conclusions on what can be done to improve the quality of the water. Students should also indicate what steps can be made in agriculture to protect water quality and ensure a safe water source for the community. Students will make a presentation to the class that summarizes their lab procedure, results, and conclusions. To extend learning, the group that has the most thorough presentation can present their findings to the School Board, local Farm Bureau, or any other local organization.

**3. Analyzing data, interpreting data and forming conclusions.**

Students will determine the best methods for organizing the data from their semester-long Agriscience Project by creating data tables. The skills in analyzing and interpreting data used during Key Assignments One and Two in this unit will be applied to the final agriscience research project. Students will make similar determinations on their Agriscience research. Students will use mathematical principles to synthesize their data, calculating a mean. Furthermore, a statistical analysis of the data will help the student determine if the results are due to chance or the independent variable that was tested. Students will choose the best way to present their data using graphs they believe will most effectively demonstrate their findings, and will further summarize what each graph shows. Finally, students will interpret the data and formulate conclusions based on the results. In the written conclusion, students will use their data to either accept or reject the original hypothesis. Conclusions should be directly supported by the data and by previous research. Students will also identify the limitations of their research, improvements that could be made to the experimental design, as well as future studies that may be conducted that relate the study at hand.

**4.Tillage Practices and the Impact they have on Runoff, Erosion and Soil Chemistry**
Students will explore how chemical bonding, chemical reactions and chemical equilibrium are demonstrated through the relationship between tilled soil and water runoff. Students build upon their knowledge of atomic structure to explore the various forms of chemical bonding that takes place between atoms of different elements as well as the role of valence electrons. To deepen understanding of chemical interactions, students will investigate both the physical and chemical changes that take place during tillage.

Students will utilize locally sourced soil samples at both pre-tillage and post-tillage intervals to compare the effects of tillage on the physical and chemical nature of soil. Ideally, multiple tillage types will be examined including conventional tillage, deep ripping tillage and conservation tillage. Soil pH, effective cation exchange capacity, soil organic carbon, and soil nutrient levels will be measured in addition to an analysis of the physical structure of the soil. Examination of the physical structure can allow students to predict potential erosion and runoff issues.

Students will then develop suggestions for best tilling practices by using GPS and topographic maps to determine the natural slope of a given plot of land. They will be asked to design the most efficient "tillage" for this plot to conserve water, prevent soil erosion and cause the least disturbance to soil and water bonding. Students must explain in a written report, including a detailed diagram, why they selected the design they did and how it will be the most beneficial for the environment using conservation techniques for the soil and water as learned in this unit. They will also explain why the alternative designs would be poor choices.

**5. Ground Water Contamination and Aquifer Lab**
Students will demonstrate how aquifers filter different contaminants by constructing a model of an aquifer and testing how groundwater contamination occurs by using common agricultural contaminants. They will analyze two different types of aquifers and determine which type they would want to place a well into and why. Students will explain how the size of the pores affects the intermolecular interactions between contaminated water and the rock, and how this in turn impacts how well an aquifer can filter out contaminants.
Students will examine how the pH of different solutions is directly affected by soil type and aquifer porosity. Students will model this by capturing water that comes through their aquifer model. Students will then determine the concentration of this type of solution through a standardized titration experiment.

Once they have used their models as a means of understanding how easily groundwater can be contaminated, they will complete their conclusion and create a multimedia production in the form of a TED talk or Infomercial that educates their community on what agriculturists do and can do to improve water quality in their local area. They will present their productions to a panel of judges and the winners will have their video/multimedia presentation broadcast school-wide.

**6.Irrigation Practices in Agriculture**
Students will understand how evaporation (due to temperature) and soil type plays a huge role in the irrigation methods and practices employed in the agriculture industry. Students will be given 3 different soil types. Students will divide these 3 soil types into 9 different samples; 3 of each in a different setting, but they will receive the same amount of water to simulate "irrigation". Students will hypothesize what they think will happen based on soil type and temperature with regard to moisture retention and how this will impact decisions in irrigation selection. In the control group the 3 soil samples will be placed outside. In test group #1, 3 samples will be placed under a heat lamp to simulate an environment with a hotter ambient temperature. In test group #2, 3 samples will be placed in a location cooler than your outside temperature. In all 3 of the test locations students will water all of the samples with equal amounts of water. The following day students will test the moisture content of all soil samples using a Kelway Soil Acidity and Moisture Meter to determine the effects that temperature and soil type had on moisture retention. Using this data, students will then complete the lab write up and finish a conclusion by summing up how this lab impacts irrigation practices.

**7. Semester One Capstone Project**
Students will submit their agriscience research in a written paper, and it will include the following components: problem/purpose, background research, hypothesis, methodology, results/data, and discussion/ conclusion. The paper will be written using skills associated with technical and scientific writing, for example, refraining from the use of personal pronouns or keeping discussion limited to what the research and data suggest rather than personal opinion and bias. APA format will be utilized to reference and cite sources. The project and its findings will be shared with the class in an oral presentation.

**Unit Four:**

**Plants and Soil Management**

**Unit Description**
Building on knowledge acquired from the previous units on the physical and chemical properties of water and soil, students will begin to determine the effects of plant, soil and water interactions with respect to maintaining or restoring environmental health and structure. Students will model how nutrients cycle through the environment, analyze how pH affects nutrient availability by changing chemical equilibrium, determine water holding capacity with respect to water availability for plant growth, and identify possible nutrient deficiencies based on plant observations. Students will apply this learning to developing knowledge of soil nutrients and their role in the environment by testing and analyzing soil samples for optimal soil structure, nutrient value and availability and determining possible soil amendments and practices to improve soil quality.

**Key Assignments**
**1.Plant Requirements from Soil Lab**
Students will demonstrate their knowledge of plant growth requirements by creating a

controlled experiment to compare the difference between natural and synthetic fertilizers on plant growth. Students will make qualitative and quantitative observations of plant growth and analyze their data in order to draw conclusions regarding the availability of nutrients and the practical application for crop growers. Fertilizers are identified with particular isotopes and as part of the assignment, students will describe nuclear processes and radiation, describing their methods of use in determining fertilizer application in commercial agriculture. Students will then create a written recommendation to a local crop producer regarding which type of fertilizer to use for their farm in order to achieve production goals, highlighting chemistry concepts as a fundamental part of the assignment.
Optional extension: Students can analyze the amounts of fertilizers needed in order to reach the desired amount necessary for plant growth and determine whether the addition of fertilizers is cost effective.

**2. Soil Management Project**
Students will analyze their data collected from unit 2 and determine which crops can be grown based on the current physical and chemical properties of the soil. Students will make recommendations for soil amendments which would increase the nutrient availability of the soil in order to grow a desired crop. Students should consider how pH, and chemical equilibrium will impact the availability of nutrients in the soil in their recommendations. Students will then plant a crop from a given list of cover crops (clover, grasses and legumes) in their soil test plot, allow it to grow and then retest the soil to see if there is a difference in the nutrient concentrations. Students will incorporate their knowledge of biogeochemical cycles into their lab report and will provide an explanation of how nutrients are being transferred from the soil to the plants. The research and experimentation conducted in this project will be added to their Soil Management Capstone Project.

**3. Plant and Soil Interactions**
Students will compare their nutrient values from the previous project with other groups during a classroom discussion. Students will analyze the data and develop explanations for why there is a difference in the amount of nutrients the plants extracted from the soil. Students will then revisit the Soil Erosion and Runoff Lab from Unit 3 and measure the amount of runoff and soil erosion that occurs on each of the cover crops and compare the data to the data collected from Unit 3. Students will communicate their results in a lab write up.

## Unit Five: Animals and Soil Management

**Unit Description**

Using knowledge from previous units about soil nutrient content, students will identify the key macrominerals and microminerals necessary for normal livestock growth and reproduction. The students will correlate the minerals present in soil with the nutrient content of typical livestock concentrate and roughage feeds. Using local resources, the students will identify mineral deficiencies or toxicities in the soil and relate the deficiencies or toxicities to livestock health. Students will identify crop and range management practices to improve the nutrient content of soil, and will explain what reactions take place at the molecular level to improve nutrient content. Students will identify various methods of using animal waste and the environmental impacts including the use of animal waste as soil amendments and fertilizers. Students will relate the units of concentration used in agriculture practice to units used in chemistry labs, as they identify problems and contaminants associated with livestock waste disposal and related health and safety regulations.

**Key Assignments**

**1. Nutrient Deficiencies in Livestock**

Students will examine the correlation between soil and plant nutrient levels with health problems in livestock. Using their knowledge of solutions and concentration, students will identify soil nutrient deficiencies in a geographic area. They will relate the nutrient deficiencies with livestock diseases. For example, if an area has a deficiency in selenium, students will identify problems such as white muscle disease in calves and lambs. Working in groups, the students will analyze a case study on selenium deficiencies in cattle and offer a solution and/or design a system to prevent or correct a mineral deficiency in livestock caused by a soil deficiency. Their analysis will be presented in a written report. An optional extension to this assignment could include testing other nutrient deficiencies, such as copper toxicity, and reporting these findings in a group oral presentation using the case study as an example.

**2. Livestock and Water Quality**

Students will examine the nutrients present in animal waste and identify possible environmental contaminates in the waste. To examine the effects of water runoff from livestock facilities, students will design a controlled experiment to test water samples from soils exposed to livestock for nitrates, phosphate, heavy metals, pH, dissolved oxygen and other factors. Students will utilize their previously collected soil samples or soil plot and design a model to simulate water run off from a livestock production facility. Alternately, students will test water runoff samples from existing livestock facilities. At the conclusion of the experiment, students will provide a written recommendation to a county land use commission with a protocol for the optimal use of the animal effluent.

**3.Livestock Waste Management**

Students will examine the challenges involved with livestock waste management. The problems may include ammonia emissions, phosphorus runoff, nitrate leaching and heavy metal runoff. The instructor will provide a problem and scenario that relates to livestock waste management from an agricultural operation. Students will research the problem and design a system or solution. For example, if a school builds a school farm and raises 10 head of cattle in confinement, how will the waste be handled? The students will consider factors such as environmental concerns, health and safety regulations, amount of waste produced, reactivity of the waste products, uses for the waste, possible cost and labor requirements.

**4. Soil Management Project**
The soil management project, which students begin in unit 2, will be ongoing throughout the length of the course. In this unit, students will identify the nutrient deficiencies or toxicities present in the soil samples that might influence livestock production. Students will develop a written proposal for the tested soil, including soil amendments, fertilizers and application of animal waste or changes in livestock management practices to address these deficiencies or toxicities. As part of the recommendation process, students will examine the use of animal waste as a method of enhancing soil quality, using background knowledge of nuclear processes to describe variability in nutrient availability in uptake. For any toxicities present, students will examine the chemical profiles of the elements and recommend strategies for resolving agricultural issues for those elements. Students will use these soil management profiles as a component of their final course project as well as use them for subsequent units.

**Unit Six:**

**Soil Sustainability**

**Unit Description**
Based on the accumulation of knowledge, examples and research conclusions from throughout the year, students will develop an understanding of sustainable agriculture by employing a Sustainability evaluation tool, "The 3-Pillars of Sustainability, economic, environmental and social impacts" of agriculture. Students will critically evaluate and justify perspectives and determine benefits/concerns based on research and credible information. Students will investigate and evaluate the sustainability of agricultural practices. Students will design and conduct a phytoremediation lab to analyze the efficacy of salt tolerant accumulators to remove saline from the soil. Students will formulate potential solutions using the three pillars of sustainability to soil and land management problems based on agricultural scenarios and debate agricultural issues.

**Key Assignments**
**1.Phytoremediation Lab**
Students will learn the about the remediative effects of plants in the uptake of soil

contaminants, in this example, reducing soil salinity. Students will research saltwater intrusion causes and implications, research phytoremediation, develop a hypothesis, design an experimental procedure, identify safety procedures specific to this experiment, collect and analyze data, and formulate conclusions. Through these steps, students will determine which types of plants are best in phytoremediation of saline ("halophytic" or salt loving plants) and the maximum amount of saline which can be removed from the soil in this way.
Possible extension: Compare efficacy of procedure with different soil types
Students will complete a formal lab write-up.

**2.Tillage Protocols: Impact on Soil Structure and Soil Sustainability Lab**
The purpose of this lab is to determine the effects of tillage practices on soil sustainability and plant growth. Using a prepared mini-plot with all three tillage examples (conventional, no-till, and low till) soil structure, students will measure and compare soil fertility, water holding capacity,and percolation. Students will analyze and graph their data, explain the implications of the each of these tillage systems with respect to soil and water sustainability and extrapolate those results to the effect of tillage practices affect on plant health. Students will create a poster to illustrate the benefits and drawbacks of each tillage system with respect to Soil-Plants-Water.

**3.Land Use Planning Model**
Student groups will make soil/land management decisions based on specific agriculture and land use restrictions on pieces of land such as large urban gardens, range management, forest management, and farmlands. Students will use their knowledge of physical and chemical properties of soil in regards to plants, animals and water to highlight the importance of sustainable agriculture. Getting a land use plan approved and in place with multiple interest groups is complicated and relies on the checks and balances to determine the success of the project. Each student in the group needs to take on a specific role in order to determine their Land Use Plan (such as conservationist, developer, owner, law enforcement, Department of Public Works, Anthropologist, City Planner, etc.). Groups will then prepare a presentation to present their plan. This presentation could be presented to the class and instructor or even community/local industry members.

**4.Agriculture Issue Debate and Policy Proposal**
Students will begin by conducting secondary research using industry journals into the global use of methyl bromide as a chemical soil sterilant. Students will examine the pros and cons of the use of methyl bromide in terms of manipulations to the chemical profile of soil, microbiology, effects on groundwater, runoff challenges and effects on agricultural productivity. Research should highlight chemical reactions as the primary point of focus. Students will then be assigned a perspective related to the methyl bromide investigation (runoff or microbiology, for example) to represent in the debate, using their list of chemistry- and agriculturally-focused pros and cons to inform their contributions. Students will end the debate with a comprehensive analysis of the issue of methyl bromide use in agriculture from multiple angles in order to develop a model policy for their county regarding the possible use of methyl bromide in agricultural applications.

**5. Soil Management Project**
The soil management project, which students began in unit 2, has continued throughout the length of the course. At the end of Unit 6, students will incorporate knowledge gained from all previous labs, and the conclusions drawn from the Phytoremediation and Tillage Protocols: Impact on Soil Structure and Soil Sustainability Labs to test, analyze, treat and/or modify soil structure and fertility for specific usage/in order to achieve desired outcomes. This work will be used as evidence in the Soil Management Capstone Project and will also aid in drawing the final conclusions of the year long research and experimentation.

**Capstone Project and Portfolio**

**1.Soil Management Capstone Project**
As the final course capstone project, students will be given a scenario and soil sample designed around their local agriculture industry. The given scenario will provide students with specific information about the topography and climate/rainfall data of the location where the soil sample was collected. Students will use knowledge and skills learned in previous units to physically and chemically analyze the soil sample.Their soil analysis should inclu de the composition and nutrient, pH, and salinity levels.The data collected from their soil sample analysis and the provided land information should be included in the soil management plan that the students create. The student's Soil Management Plan will recommend soil amendments, proper tillage practices, optimal irrigation methods, crop recommendations, and animal use suggestions.Their recommendations and suggestions should be justified in terms of the 3-pillars of sustainable agriculture.

**2. Course Portfolio**
The course portfolio will provide evidence of real-world agriculture application of scientific research done throughout this course.The portfolios will highlight student work from throughout the course to show a progression of learning, experimentation, and application of course content. Items that will be included in the portfolio are student lab reports, the Agriscience Research paper, and their Soil Management Plan.

**Course Materials:**

**Primary Materials:**
Plant & Soil Science Fundamentals and Applications by Rick Parker, Delmar Cengage Learning

Principles of Soil Chemistry 4th edition by Kim Tan, CRC Press

**Supplemental Materials:**

Environmental Science Fundamentals and Applications Delmar Cengage Learning
Chapters 1-3; 5 & 6

Environmental Science and Technology Second Edition Agriscience & Technology
Chapters 10, 13, 14 & 15

Environmental Science 10th Edition; G. Tyler Miller, Jr.
Chapters 9, 13 & 14

Environmental Science 7th Edition; Bernard J. Nebel & Richard T. Wright, Prentice Hall

The Science of Agriculture A Biological Approach 2nd Edition; Ray V. Herren; Delmar Thomson Learning

Agriscience Fundamentals and Applications 6th Edition; L. DeVere Burton, Cengage Learning

Environmental Science 1st Edition, 2013; Michael Heithaus; Karen Arms; Houghton, Mifflin, Harcourt

How to Write a Scientific Paper by Robert A. Day

National FFA Agriscience Fair Handbook https://www.ffa.org/documents/agsci_handbook.pdf

National FFA Research Report Template
https://www.ffa.org/programs/awards/agriscienceFair/Pages/default.aspx

Unit 1-Assignment 1:
http://www.todayshomeowner.com/diy-soil-texture-test-for-your-yard/

Unit 3- Assignment 2:
https://www.lcmm.org/education/resource/on-water-ecology/worksheet-water-quality-testing.pdf

Unit 4 Assignment 1
http://www.cfaitc.org/lessonplans/pdf/403.pdf
http://www.cfaitc.org/lessonplans/pdf/404.pdf

Unit 5 Assignment 1
http://www.sites.ext.vt.edu/newsletter-archive/livestock/aps-06_04/aps-313.html

# Agriculture & Soil Chemistry Pacing Guide

Based on a 50-60 minute period
Approximately 130 Days Of Lessons
(This does not include FFA, Record Books, SAE, Agriscience Fair Work Days, etc.)

**UNIT 1 - AGRISCIENCE PRACTICES**
**Length of time: 7-8 Days (2 weeks of observations)**

| **Length** | **Topic(s) and/or Labs** | **NGSS and Ag Standards Covered** | **Materials** |
|---|---|---|---|
| 1 day | ASC1.1 Scientific Method | | ASC1.01.a. Sci. Method slides<br>ASC1.01.b. Practice worksheet (hypothesis, variables, data collection, data analysis) |
| .5 days | ASC1.2 Lab Safety | | ASC1.02.a. Safety Notes<br>ASC1.02.b.Safety Quiz |
| .5 days to set-up<br><br>.5 days on lab reports and obsv. | ASC1.3 Mini-Lab 1: Soil Structure & Composition<br><br>ASC1.4 Proper Lab reports<br><br>-Lab observations (2 days) | | **ASC1.03. Key Assignment - See mini-lab handout**<br><br>ASC1.04. Lab report guidelines |
| 1 day | ASC1.5 Research Proposals | | ASC1.10.c. Notes/guidelines for proposal<br>ASC1.06 Mini-lab 2 handout for proposal formation |
| .5 day | Prep for first lab in next unit - read document ASC3.03.b. Soil Erosion and Runoff Lab | | ASC3.03.b. Soil Erosion and Runoff Lab |
| 1 day | ASC1.6 Mini-Lab 2: Water & Soil Management | | **ASC1.06 Key Assignment** |
| 1 day to set-up and learn to test soil<br><br>10 minutes each day for 2 | ASC1.7 Mini-Lab 3: Plant & Soil Management<br>-Soil Testing procedure<br>-Lab Observations and testing (2 weeks) | | **ASC1.07 Key Assignment** |

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| weeks | ***TIME SAVING OPTION - combine mini-lab 3 & 4!** | | |
| 1 day to set up<br><br>10 minutes each day for 2 weeks | ASC1.8 Mini-Lab 4: Animal & Soil Management<br><br>-Lab observations and testing | | **ASC1.08 Key Assignment** |
| 1 day | ASC1.9 Mini-Lab 5: Technology | | **ASC1.09 Key Assignment** |
| 1 day | ASC1.10 Agriscience Fair Overview, Credible Sources, and Proposal Guidelines | | ASC1.10.a. Agriscience Fair Slides<br>ASC1.10.b. Agriscience Fair Due Dates<br>ASC.1.10.c. Proposal guidelines & worksheet<br>ASC1.10.d. Credible Sources Website<br><br>**SEE THE AGRISCIENCE PROJECT FOLDER UNDER UCCI CURRICULUM!!** |

## UNIT 2 - THE NATURE OF SOIL
## ~25 DAYS

| Length of Lesson | Topic(s) Covered | NGSS and Ag Standards Covered | Materials |
|---|---|---|---|
| **1 day** | ASC2.1 Properties of Matter | | ASC2.01.a. Mixtures, Elements and Compounds Slides<br>ASC2.01.b. Notes Page |
| **1 day** | ASC2.2 Electrons & Periodic Table | | ASC2.02.a. Exploring the periodic table packet<br>ASC2.02.b. Atoms Family |
| **1 days** | ASC2.3 Atomic model | | ASC2.03 Atomic Basics Handout |
| **2 days** | ASC2.4 Rock Cycle | | ASC2.04.a. Rock Cycle Slides<br>ASC2.04.b. Rock Cycle Game<br>**2.04.c. Key Assignment - Sedimentary Rock Lab** |

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| **1 day** | ASC2.5 Soil Formation and Characteristics | | ASC2.05.Soil Formation and components Slides |
| **1 day** | ASC2.6 Soil Triangle | | ASC2.06.a. Soil Triangle Handout<br>ASC2.06.b. Soil Triangle Activity<br>ASC2.06.c. The Dirt on Soil - Worksheet |
| **2 days** | ASC2.7 Collect & Test Soil Samples: Physical | | ASC2.07.a. Soil Sampling Slides<br>ASC2.07.b. Soil Texture Test Lab<br>ASC2.07.c. Part 2 of test lab<br>ASC2.07.d. Soil Studies Worksheet |
| **1 day** | **ASC2.8 Collect & Test Soil Samples: Physical Properties Lab** | | **ASC2.08 Key Assignment - Physical Properties Lab** |
| **1 day** | ASC2.9 Chemical Properties - soil testing | | ASC2.9.a. Soil Chem Slides<br>ASC2.9.b.Soil Chem Slides Notes Page |
| **1 day** | ASC2.10 Ions | | ASC2.10.a. Ions Slides<br>ASC2.10.b. Cation, Anion Worksheet<br>ASC2.10.c. Narrative Element Story<br>(suggested as homework) |
| **1 day** | ASC2.11 Soil Fertility | | ASC2.11 Soil Fertility Slides |
| **1 day** | **ASC2.12 Soil Testing: Chemical Properties Lab** | | **ASC2.12 Key Assignment - Chemical Properties Lab** |
| **2-3 days** | ASC2.13 Agriscience Project -Background Scholarly Research & Forming a Hypothesis<br>National FFA Agriscience Fair Handbook | | See Section 1.2 in Research Resource Link<br>ASC2.13.a. National FFA Agriscience Research Resource<br>ASC2.13.b. Simpson's Variable and Hypothesis Worksheet |

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| | | | Resource: How to Write a Hypothesis<br>**ASC2.13.c. Key Assignment - Forming a Hypothesis** |
| **3 day** | ASC2.14 Experimental Design | | **ASC2.14 Key Assignment - Experimental Design**<br>*Industry Experts/Local Producers Review*<br>Resource: Qualitative vs Quantitative Data<br>Resource: Experimental Research Designs |
| **1 day** | ASC2.15 Soil Purposes & Capabilities | | ASC2.15.a. Soil Purposes & Land Capabilities Slides<br>ASC2.15.b. Soil Purposes Poster Project |
| **2 days** | ASC2.16 Soil Maps | | ASC2.16.a. Smithsonian Soil Webquest<br>ASC2.16.b. Web Soil Survey Guide |
| **1 day** | ASC2.17 Local Soil Maps | | ASC2.17.a. Web Soil Survey Activity 1<br>ASC2.17.b. Web Soil Survey 2<br>ASC2.17.c. Web Soil Survey Rubric |
| **1 day** | **ASC2.18 Creating Soil Maps** | | **ASC2.17 Key Assignment - Creating Soil Maps** |

## UNIT 3 - WATER AND SOIL MANAGEMENT ~40 DAYS

| **Length of Lesson** | **Topic(s) Covered (Key Assignment)** | **NGSS and Ag Standards Covered** | **Materials** |
|---|---|---|---|
| 1-2 days | ASC3.1 Topography Maps | | ASC3.01.a. Topography Slides<br><br>Video clip explaining how to read topographic maps: |

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| | | | http://www.nps.gov/webrangers/activities/readingmap/<br><br>ASC3.01.b. Map Reading Practice Worksheet<br><br>Needed: Sample topo maps with marked points. |
| 1 day | ASC3.2 Water cycle & runoff | | ASC.3.02. Water Cycle & Runoff Slides<br><br>Interactive Water Cycle Resource: Use URL:<br>http://water.usgs.gov/edu/watercycle-kids-adv.html<br><br>*Option: have students make a foldable, poster, and t-shirt design based on the water cycle and runoff. |
| 2 Days | ASC3.3 Soil Erosion/Deposition | | ASC3.03.a Erosion Slides<br><br>**ASC3.03.b. Key Assignment: Soil Erosion Runoff Lab**<br><br>ASC3.03.c. Runoff Reading Resource |
| 2 Days | ASC3.4 Water Movement & Water Holding Capacity<br>-<br>Cohesion/Adhesion<br>-Water Potential<br>-Capillary Action<br>-Bonding | | ASC3.04.a. Soil Water Slides<br><br>Refer students back to unit 1 assignment -<br>ASC1.06 Water and Soil Management Lab<br>*If you did not do this lab in unit 1, do it now.<br><br>Water Holding Capacity Demonstrations - Use URL<br>http://www.joe.org/joe/2014august/tt10.php<br>ASC3.04.b. Lewis Dot Diagrams<br><br>ASC3.04.c. Ionic Bonding Worksheet |
| 1 day | ASC3.5 Water Quality | | Have students read and outline:<br>How do we measure the quality of our waters?<br>Use URL:<br>http://water.epa.gov/learn/resources/measure.cfm<br><br>**ASC3.05. Key Assignment: Water Quality Testing** |
| 2 Days | ASC3.6 Data Analysis:<br>-significant figures<br>-conversions | | ASC3.06.a. Scientific Measurements Slides<br><br>ASC3.06.b. Sig Figs Worksheet<br><br>ASC3.06.c. Precision Vs. Accuracy BullsEye Worksheet |
| 4-5 days | ASC3.7 Stoichiometry<br>-Moles | | ASC.3.07.a. Basic Stoichiometry Slides<br>***NOTE: This is a HUGE file - use this in chunks - not all at once!** |

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| | -Molar Mass<br>-Types of Reactions<br>-Mole calculations<br>-Limiting Reactants<br>-% Composition<br>-Balancing Equations<br>-% Yield of reaction | | ASC3.07.b. Stoich Notes<br><br>ASC3.07.c. Chemical Equations Slides<br><br>ASC3.07.d. Balancing Equations with Skittles<br><br>Balancing Equations Resource link:<br>http://teachnlearnchem.com/Equations.htm<br><br>ASC3.07.e. Stoich Smores Lab<br><br>ASC3.07.f. Moles Tutorial Worksheet<br><br>ASC3.07.g. How Many Moles Are In Your Name?<br><br>ASC3.07.h. Types of Reactions Worksheet<br><br>ASC3.07.i. Mole Ratio Slides<br><br>ASC3.07.j. More Calculation Tutorial Work Problems<br><br>Mole Ratio Resource Link<br>http://teachnlearnchem.com/Formula.htm<br><br>Formula Resource Link:<br>http://teachnlearnchem.com/Formula.htm<br><br>Stoichiometry Resource Link:<br>http://teachnlearnchem.com/Stoichiometry.htm |
| 3 Days | ASC3.8 Solution and Solubility<br>-Molarity<br>-Toxicity | | ASC3.08.a. Molarity, Solutions, and Solubility Slides<br><br>ASC3.08.b. Molarity Murder Mystery<br><br>ASC3.08.c. Molarity of Lemonade<br><br>OPTION: Solutions lab- create a fertilizer and calculate the percentage of element present<br><br>Resource:Explanation of molar mass - Use URL:<br>http://chemistry.stackexchange.com/questions/1116/percent-composition-of-nitrogen-in-fertilizer<br><br>Resource: Calculating pounds of N in a fertilizer bag:<br>Use URL:<br>http://www.greenviewfertilizer.com/articles/how-much-nitrogen-in-fertilizer |

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| | | | Resource: List of available nutrients in different fertilizers:<br>Use URL:<br>http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex3791 |
| 1 day | ASC3.9 Salinity | | Lab - use URL<br>http://omp.gso.uri.edu/ompweb/doee/science/physical/chsal1.htm<br><br>Demo - use URL<br>http://science.nasa.gov/earth-science/oceanography/physical-ocean/salinity/ |
| 1 day | ASC3.10<br>Quality water sources | | How do we measure the quality of our waters?<br>http://water.epa.gov/learn/resources/measure.cfm<br><br>Have students break into groups and prepare a 60 second presentation on each item scientists test for to check for water quality.<br><br>ASC3.10 Water Testing Field Trip/Water Collection/Testing Lab |
| 3 Days | ASC3.11 Data Interpretation:<br>-graph types<br>-graph nomenclature<br><br>AgriScience Fair Data Analysis | | ASC3.11.a. Data Slides<br><br>ASC.3.11.b. Data Interp<br><br>ASC3.11.c. **Key Assignment - Analyzing Data**<br><br>ASC3.11.d. How to Graph Data in Excel<br><br>ASC3.11.e. Writing the Paper<br>*Note: See section on writing conclusions.<br><br>Resource: AgriScience Fair Reference Materials |
| 3 Days | ASC3.12<br>Tillage types<br>-conventional<br>-deep ripping<br>-conservation tillage<br>-no till | | ASC3.12.a. Tillage Slides<br><br>**ASC3.12.b. Key Assignment: Tillage Practices and the Impact they Have on Runoff, Erosion and Soil Chemistry** |

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| 5 Days | ASC3.13 Groundwater and Aquifers | | ASC3.13.a. Groundwater and Aquifers Slides<br><br>Resource:How do Scientists find groundwater - Use URL: http://water.usgs.gov/edu/gwhowtofind.html<br><br>ASC3.13.b. Groundwater Contamination Reading resource<br><br>ASC3.13.c. Groundwater Pollution Lab<br><br>ASC3.13.d. **Key Assignment** Groundwater Contamination Lab |
| 3-4 Days | ASC13.14 Filtration<br>-filter strips<br>-titration | | Soil as a Filter Activity - Use URL: http://www.doctordirt.org/teachingresources/soilfilter<br><br>ASC3.14 Titration Lab |
| 2 days | ASC3.15 Irrigation Practices | | ASC3.15.a. Irrigation Methods Slides<br>*NOTE: This goes into great depth - you may want to skip some!<br><br>Show YouTube video clips of each type of irrigation.<br><br>**ASC3.15.b. Key Assignment Irrigation Practices** |
| 3 days | Agriscience Project Report | | ASC11.e. Writing the Paper |

## UNIT 4 - Plants and Soil Management ~15 DAYS

| Length of Lesson | Topic(s) Covered | NGSS and Ag Standards Covered | Materials |
|---|---|---|---|
| 2-3 | ASC4.1 Plant essential | | ASC 4.01a Plant Nutrients and Deficiencies |

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| Days | nutrients and nutrient deficiencies<br><br>Key Assignment 1: Begin Lab Set Up (Planting of Seeds, Data Collection) | | ppt<br><br>ASC 4.01b PLant Nutrients and Deficiencies student notes<br><br>Teacher's Note: Keep all soil samples from unit 2. All planting to be done using Soil from unit 2- do not throw out when complete as they will be used for the duration of the unit.<br>Students should select from the following seed type, encouraging variation: Alfalfa, White Clover, Red Fescue. |
| 1 day | ASC4.2 Soil NPK testing<br><br>Key Assignment 1: Data Collection | | **ASC 4.02 Key Assignment Soil NPK Testing**<br><br>ASC4.02.b. Nitrogen Cycle in Ag LP<br><br>ASC4.02.c. Legume Activity<br><br>ASC4.02.d Legumes and Nitrogen<br>ASC4.02.e. Nitrogen Scramble |
| 2 days | ASC4.3 Soil Amendments -organic and synthetic<br>How to read a fertilizer label<br>Key Assignment 1: Data Collection | | ASC 4.03a Soil Amendments ppt<br><br>ASC 4.03b Soil Amendments Student Notes<br><br>Day 2: ASC 4.03c Reading a Fertilizer Label Activity<br>Materials Needed: Various Types of Fertilizers (Granular & Liquid)<br>ASC4.03.d. Fertilizer Label Activity<br><br>ASC4.03.e. Fertilizer Homework |
| 2 days | ASC4.4 Soil Analysis - Concentrate on the Solution<br>Key Assignment 1:<br>Data Collection | | ASC 4.04a Teacher Guide<br><br>ASC 4.04b Key Assignment Student Worksheet<br><br>ASC 4.04c Answer Key to student worksheet<br><br>Note: Lesson from CA Ag in the Classroom |
| 1 day | ASC4.5 Key Assignment 4.1 | | **ASC 4.05a Key Assignment 1** |
| 1 day | ASC4.6 Nutrient availability<br>• review plant | | ASC 4.06a Analyzing Nutrient Availability ppt |

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| | essential nutrients<br>• nitrogen cycle<br>• pH nutrient availability<br>• Cation Exchange Capacity | | |
| 1 day | ASC4.7 Humanity against Hunger Case Study<br>• analyze plants to determine nutrient deficiencies | | ASC 4.07 Humanity Against Hunger pdf<br><br>Teacher note:<br>Read the teacher directions. Print for each group one copy of master 4.3a-c and 4.5a-d. Print each student one copy of 4.4 handout. Group handouts should be printed in color. |
| 4 days | ASC4.8 Key Assignment 2 Begins: Research Possible Soil Amends and Apply if necessary | | **ASC 4.08a Key Assignment 2 directions**<br><br>ASC 4.8b Student Data Collections page<br><br>ASC4.08.c Key Assignment Resource 1<br><br>ASC4.08.d Key Assignment Resource 2<br><br>ASC4.08.e Key Assignment Resource 3<br><br>Teacher Notes: Be prepared with all possible soil amendments (See keys in Section 2 Folder). Planned for amendments to happen on a Friday then finish the next Friday so there are only 5 days of data collection<br><br>**ASC4.09.a. Key Assignment 3**<br>*NOTE: Students will need reports from ASC4.08.a. as well as from ASC3.03.b. |

## UNIT 5 - Animals and Soil Management ~13 DAYS

| Length of Lesson | Topic(s) Covered | NGSS and Ag Standards Covered | Materials |
|---|---|---|---|
| **3 Days** | ASC5.1 Macro Nutrients for livestock health Micronutrients for livestock | | ASC5.01.a Livestock Macronutrients Slides<br><br>Reading on Macro/Micronutrients - Use URL: http://msucares.com/pubs/publications/p2484.pdf |

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| | health | | ASC5.01.b. Minerals in Soil Lab<br>*Will need this Beef Cattle Nutrients Article - Use URL: https://www.ag.ndsu.edu/pubs/ansci/beef/as1287.pd |
| **3 Day** | ASC5.2 Deficiencies that lead to diseases | | ASC5.02.a. Manure and Nutrient Management Plans Slides<br><br>ASC5.02.b. Key Assignment 1 - Mineral Deficiency Case Study |
| **2 Days** | ASC5.3 Simulating Livestock Facility Water Runoff Lab | | Two EPA articles on Water Quality and Protection from livestock runoff - Use URLS:<br>(1)http://water.epa.gov/polwaste/nps/agriculture_facts.cfm<br><br>(2)http://www.epa.gov/region9/animalwaste/problem.html<br>*Students can do a CLOSE reading on this article.<br><br>ASC5.03. Key Assignment 2 - Simulating Livestock Water Facility Runoff Lab |
| **2-3 Days** | ASC5.4 Livestock Waste Concern Presentation | | ASC5.04.a. USDA Waste Management Pamphlet<br><br>ASC5.04 Key Assignment 3 - Livestock Waste Management<br>*NOTE: Give students this URL to read and help with management plan.<br>Study on Impacts of Animal Waste Management Practices<br>http://lshs.tamu.edu/docs/lshs/end-notes/modelinganimalwastemgmt-1077313798/modelinganimalwastemgmt.pdf |
| **2 Days** | ASC5.5 Key Assignment 4 - Complete Soil Management Plan | | **ASC5.05 Key Assignment 4** |

## UNIT 6 - SOIL SUSTAINABILTY
## ~28 DAYS

| **Length of Lesson** | **Topic(s) Covered** | **NGSS and Ag Standards Covered** | **Materials** |
|---|---|---|---|
| **5 days** | ASC6.1 Introduction to Sustainability and the three “E’s”<br>• Sustainability Powerpoint and student notes<br>• Review student assignment and grading process | | ASC6.01.a. Debate Lesson Plan<br>ASC6.01.b. Powerpoint<br>ASC6.01.c. Student Notes<br><br>ASC6.01.d. Sustainability Debate Assignment |

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| | | | ASC6.01.e. Prepare for Debate worksheet |
| **2 days** | ASC6.2 Sustainability and the three "E's"<br>• Students research topic and key points to debate | | Laptops for students to research<br><br>(students fill out<br>Prepare for Debate wksht) |
| **2 days** | ASC6.3 Sustainability and the three "E's"<br>• Students debate on their topics | | ASC6.03.a. Debate Rubric<br><br>ASC6.03.b. Letter to Mayer (optional) |
| **3 days** | ASC6.4 What is phytoremediation?<br><br>**Key Assignment #1 Phytoremediation Lab**<br>**Plant uptake of contaminants and environmental impact** | | ASC6.04.a. Phyto Slides<br><br>ASC6.04.b. Phytoremediation Lab - teacher version |
| **1 Day** | **ASC6.5 Key Assignment #2**<br>**Tillage Protocols: Impact on Soil Structure and Sustainability Lab** | | ASC6.05 Tillage Protocols Lab |
| **2-3 days** | ASC6.6 Introduction to Land Use Planning- restrictions,regulation and players.<br><br>**Key Assignment #3 - Land Use Planning Model Inquiry Lab** | | ASC6.06.b. Land Use Planning Model Lab<br><br>ASC6.06.c. Land Use Plan Activity |
| **3 days** | ASC6.7 Agriculture Issue Debate and Policy Proposal<br>• Review student assignment<br>• Assign groups and discuss expectations | | ASC6.07.a. Lesson Plan<br><br>ASC6.07.b. Student assignment for Agriculture Issue and<br><br>ASC.6.07.c. Policy Proposal<br><br>ASC6.07.d. Student Prepare for Debate worksheet<br><br>ASC6.07.e. Student debate rubric<br><br>ASC6.07.f. Student Policy Proposal rubric |

| | | | |
|---|---|---|---|
| **2 days** | ASC6.8 Research industry journals and begin examining pros/cons on methyl bromide use | | Computer |
| **1-2 days** | Class debate | | |
| **2-3 days** | ASC6.9 Students design model policy for their county regarding possible use of methyl bromide | | Type up Student Policy Proposal<br>ASC6.07.c. Student Policy Proposal worksheet |
| **2 Days** | ASC6.10 Soil Management Plan | | ASC6.10 Mini Soil Management Plan |

COURSE CAPSTONE PROJECT
Suggestions can be found on document

# Quality Criteria One

**1A. The curriculum includes the components required under Section 52454 of the Education Code: organized classes in the study of agriculture science and technology; student supervised agricultural experience; and program of leadership, organization and personal development.**

Central Valley High School Agriculture department supports 5 teachers who serve students through 4 career pathways and teach a combination of 17 different courses. Every student enrolled in agriculture classes is a member of the FFA and is registered using the R-2 database. Students are required to participate in at least 4 FFA activities each semester as well as to participate in a Supervised Agricultural Experience and maintain an FFA record book. These activities account for 10% of the students' overall class grade. By encouraging students to participate in FFA activities, students are able to gain leadership skills and career readiness skills that will help prepare for future participation in the workforce.

Courses taught at Central Valley include:

**<u>Ag Biology</u> CSU/UC (d) GRAD CREDIT: Life Science 9th –12th grade**
This college pre course follows a fundamental approach to biology as it relates to agri-science. Topics of study include organisms and their environments, plant science and animal science. Laboratory experiments will reinforce classroom concepts. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**<u>Advanced Ag Biology</u> CSU/UC (d) GRAD CREDIT: Life Science 9th –12th grade**
This accelerated rigorous course is designed for Honors/Gate agriculture students who are college-bound. This course involves in-depth study of cellular organization and processes, reproduction of plants and animals, genetics, evolution, physiology of agriculture plant and animals and ecology. Emphasis will be placed on investigation, analysis, and critical thinking of course contents through labs and agriculture research projects. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**<u>Ag Chemistry</u> CSU/UC (d) GRAD CREDIT: Physical Science 10th -12th grade**
This is a college preparatory course for students interested in pursuing agricultural science programs in college, with emphasis on chemistry's applications to the environment and agricultural practices. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Students will also develop and present a content-relevant research project. <u>**Prereqisite:** Successful completion of Ag Biology or instructor approval.</u>

**<u>Veterinary Science</u>  CSU/UC (g)     GRAD CREDIT:  Elective          11th –12th grade**
This course provides a basic overview of the veterinary field covering career skills, career opportunities, sanitation, various species of small animals, anatomy and physiology, nutrition, disease control, lab skills, pharmacology, emergency procedures, radiology, and common surgery procedures. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. <u>**Prerequisite:** Completion of Animal Science or instructor approval</u>.

**<u>Animal Science</u>  CSU/UC (g)          GRAD CREDIT: Elective          10th –12th grade**
This advanced course in Animal Science will focus on livestock management practices. Included in this course will be livestock breeds, health care, handling facilities, anatomy and physiology, artificial insemination and breeding practices, judging and many other hands-on activities. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course<u>. **Prerequisite:** Completion of Intro to Animal Agriculture or instructor approval.</u>

**<u>Intro To Animal Agriculture CSU/UC (g)</u> GRAD CREDIT: Elective   9th -12th   grade**
This course provides a survey of the livestock industry, including the supply of animal products and their uses. A special emphasis is placed on the origin, characteristics, adaptation and contributions of farm animals to the agriculture industry.  Students have the ability to have hands on experience with livestock animals within this course.  There will be a main focus on animal industry history, external anatomy, breeds, feeding, showing and general care and veterinary practices.  Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**<u>Intro To Power Mechanics</u>          GRAD CREDIT:  Elective          10th –12th grade**
This introductory course will focus on small engines.  The subjects that will be covered are internal combustion, electrical systems, fuel and fuel systems, hydraulics, maintenance and repair.  The class will emphasize hands- on experience. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**<u>Intro To Ag Mechanics</u>          GRAD CREDIT:  Elective          9th –12th grade**
This course is designed to provide students with basic skills and knowledge in the areas of shop safety, rope work, cold metal, plumbing, electrical, wood working, and welding.  Students will receive classroom instruction as well as "hands on" experience. Each unit of instruction includes a required project that is designed to allow the student to apply those skills learned in the classroom to a practical application and will be shown at the Stanislaus County Fair. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**<u>ROP Power Mechanics</u>** **GRAD CREDIT: Elective** **$11^{th}$ – $12^{th}$ grade**
This is a project-based course where students will learn the fundamentals of operations and engine diagnostics. Students will perform engine assembly and disassembly. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. <u>**Prerequisite:** Successful Completion of Intro to Power Mechanics, or instructor approval.</u>

**<u>Introduction To Plant Production</u>** **GRAD CREDIT: Elective** **$10^{th}$ – $12^{th}$ grade**
This class will focus on how to grow and care for house plants and plants used for landscaping. Students will learn how to reproduce plants, provide fertilizer, pest control, marketing and operate a greenhouse through hands-on experience. If you like plants, this is the class for you. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**<u>ROP Plant Production</u>** **GRAD CREDIT: Elective** **$11^{th}$ – $12^{th}$ grade**
This two-period course deals with landscape design, installation and maintenance. Topics of study include: landscape design, study of color, location of lawns, trees, shrubs, walks, driveways, patios, planters, and other landscape structures for home and parks. A great deal of the class consists of hands-on-activities. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**<u>Ag Welding</u>** **GRAD CREDIT: Elective** **$10^{th}$ – $12^{th}$ grade**
Students will learn how to arc weld, oxy-acetylene weld, cut, braze, and MIG (wire feed) weld. Students will get experience in basic project construction. All completed projects will be shown at the Stanislaus County Fair in Turlock. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.
<u>**Prerequisite:** Successful Completion of Intro to Ag Mechanics, or Instructor Approval.</u>

**<u>ROP Welding</u>** **GRAD CREDIT: Elective** **$11^{th}$ – $12^{th}$ grade**
This two period course is for the development of advanced welding skills. Students learn advanced skills in arc welding, MIG (wire feed), oxyacetylene welding and cutting, plasma cutting, and TIG (Tungsten and Inert Gas welding). Students will further develop job-related skills by becoming self-starters and acquiring necessary materials for projects, while developing safety and fire prevention attitudes. Students will earn college credits at Modesto Junior College if they complete the class and enroll at MJC. They will be prepared for a job in a welding shop. All completed projects will be shown at the Stanislaus County Fair. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**ROP Welding Fabrication Ii** **GRAD CREDIT: Elective** **12$^{th}$ grade**
This two period course, Welding & Fabrication provides serious students with entry-level skills at the completion of the course. Instruction is provided in advanced Shielded Metal and Gas Metal Arc Welding (M.I.G.) and advanced Oxy-Acetylene Welding. Gas Tungsten Arc Welding (T.I.G.) is also covered. Students are required to develop skills in welding overhead and completing welding certification tests, along with refining skills in operating the Air Carbon Arc, Plasma Arc, and Oxy-Acetylene cutting units. Students receive instruction in safety, hand and power tool usage, planning, and material selection and usage as related to the construction of items used around the shop and home. Students experiment with their own ideas and methods in the design and fabrication of an individual project. Students are allowed one semester to complete this task. If taken a second year, students are able to work on more complex projects that are more intense in design and fabrication. Students are encouraged to exhibit their projects at the local county fair and the California State Fair. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.
**Prerequisite**: Course: ROP Ag Welding.

**ROP Intro To Floriculture** **GRAD CREDIT: Elective** **9$^{th}$-12$^{th}$ grade**
This course is designed for students who are interested in the art of floral design. This course will cover flower care and processing, tool identification, flower ID, basic flower arranging, corsage construction, balloon design, and house plant care. The class will do seasonal projects with fresh flowers and dry materials. This class will prepare students for Ag Floriculture (ROP). Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**ROP Ag Adv Floriculture** **CSU/UC (f) GRAD CREDIT: Fine Art or Elective 11$^{th}$ –12$^{th}$**
The Advanced Ag Floriculture ROP course will give students career experience in floral design and the artistic principles of visual art. Students will create floral arrangements using advanced design principles. Part of the class will be designing and arranging for outside floral sales such as weddings and events. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**Ag Leadership** **GRAD CREDIT: Elective** **9$^{th}$-12$^{th}$ grade**
This course is designed to promote and develop leadership in the Agriculture Industry. Topics will include current issues in Ag, Ag legislation, development of personal leadership skills, FFA operation and Judging Teams and exploration of past and present needs in the Ag Industry and its leaders. This course will be offered during 0 period. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**. The Career Technical Education Model Curriculum Standards for the Agriculture and Natural Resources Industry Sector are the basis for the content of courses offered. Curriculum addresses "Foundation" and "Pathway" standards within the program pathway(s) and course sequences.**

When I began teaching at Central Valley High School in the Fall of 2009, there were 5 teachers as there is now, however the progression of students through pathways was inconsistent at best and there was an extreme number of freshmen students in comparison to the number of sophomore students and "program completers." There were 6 sections of Ag Biology, a freshman course, taught by 3 teachers, whereas there were no sophomore specific courses offered and only about 50 sophomores in the agriculture department. All courses utilized Agriculture and Natural Resources Industry Sector standards, however the sequencing of skills from one course to the next were not clearly outlined.

One of the first focuses I started to explore to help our department was a sophomore level science course that could satisfy UC/CSU a-g requirements as well as allow our students to stay involved in FFA all 4 years of high school. By visiting other schools, we settled on proposing Ag Chemistry in 2011 and I have been teaching the course ever since. We have increased our sophomore population of students from less than 50 to well over 100 and have significantly improved our leadership and FFA participation as a result as well.

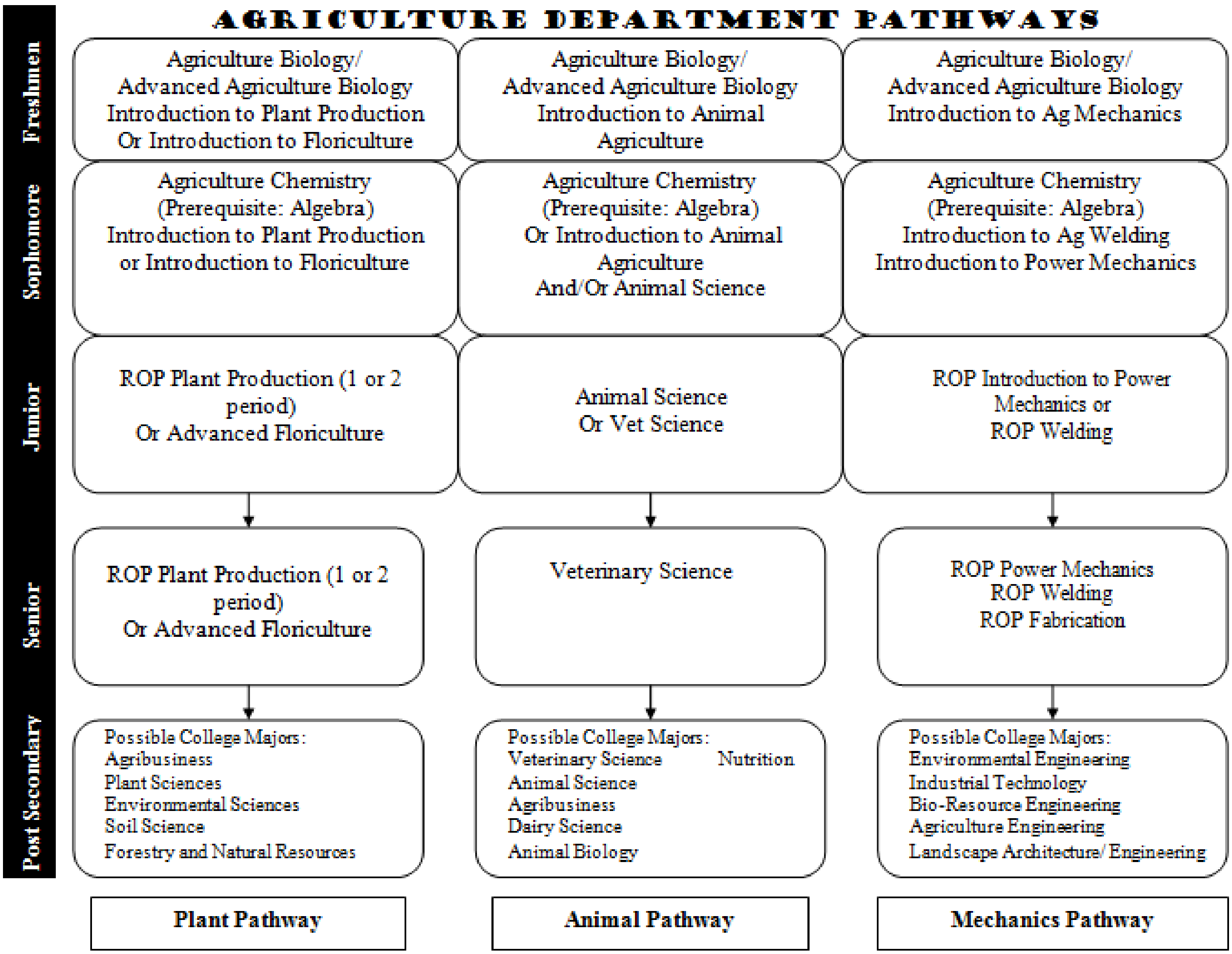
We decreased our number of Ag biology sections from 6 down to 3, including one section of advanced, in order to focus students into an agriculture pathway rather than serving single course participating students. We acquired a 6.5 acre parcel of land near the school campus to use for our plant production classes as part of the new district farm.

In 2012, all 5 teachers in the ag department met with the goal of improving the sequencing of our pathways as well as identifying "holes" in the pathways that could be served through course additions or removal. Based in this meeting, we proposed Introduction to Animal Agriculture to create a true animal science pathway where it previously had only been a 3 year pathway. We also limited Intro to Power Mechanics to $10^{th}$ -$12^{th}$ grades to focus the mechanics pathway.

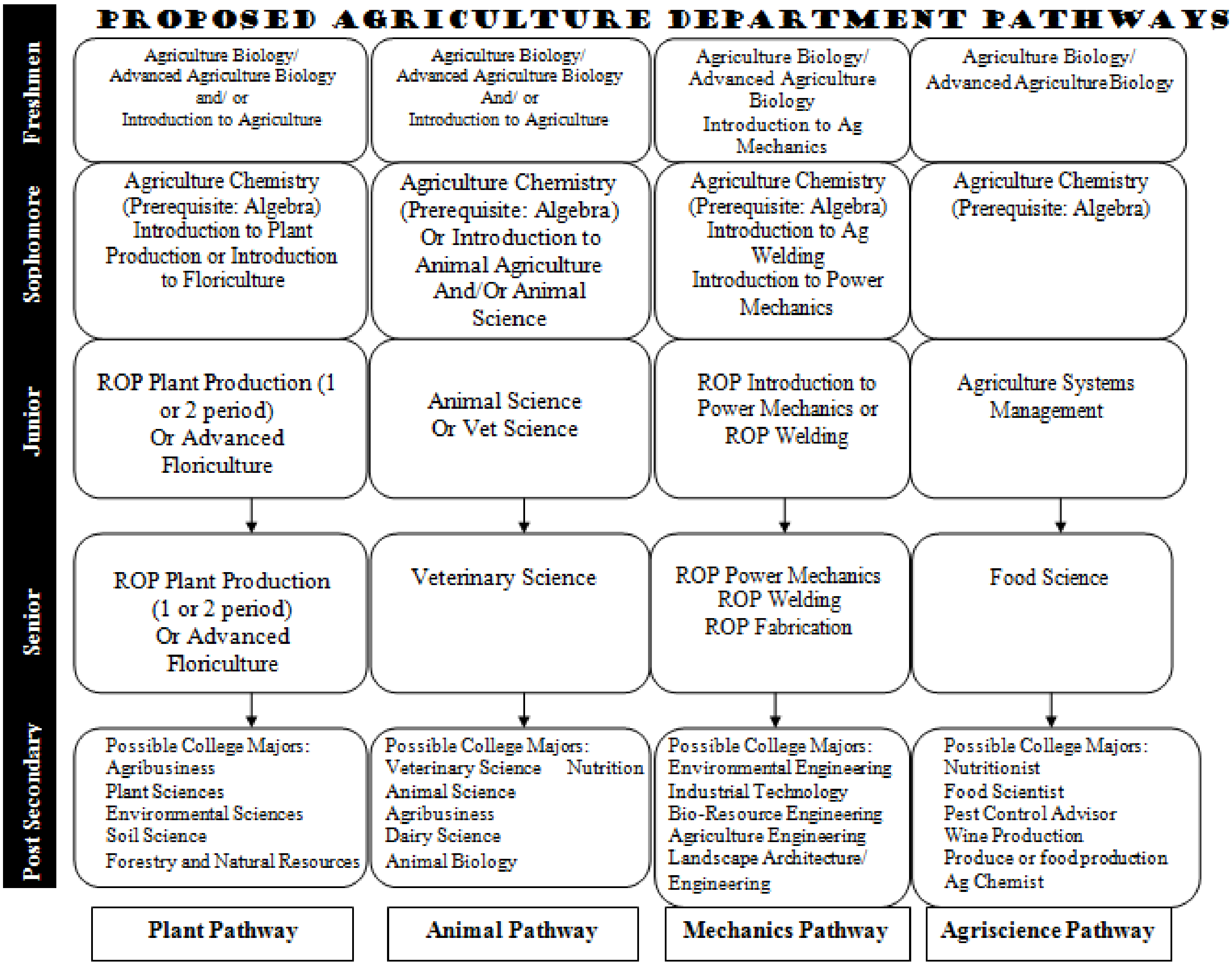
Currently, Central Valley has 3 solid pathways of Ag Mechanics, Animal Science, and Plant Science/ Production. Our next focus will be to adopt the 3 UCCI Ag Science courses, in place of Ag biology and Ag chemistry, as well as adding Food Science as a $4^{th}$ year capstone course for the new Agriscience pathway.

**1C. Career Paths in agriculture have been identified and can be found on a chart or diagram in the Program Plan.**

As stated above there are 3 current pathways for the agriculture department. The department is currently in the process of increasing that to 4 pathways with the addition of an Agriscience pathway. Below are flow charts of the current and proposed pathway diagrams used by our counseling staff and provided for students when balloting for classes.




Current Agriculture Department Pathway diagram




Proposed Agriculture Department Pathway diagram

**1D. The school master schedule allows students to follow the recommended sequence of agriculture courses to complete the selected career path(s).**

Central Valley is a unique school in that every staff member has the ability to participate in the master scheduling process. Administrators meet with the department heads to input into facility restrictions, of which the Ag department has many. I have participated in this process for 3 years now; 2 of which have been while serving as department head. With a teaching staff of 78 teachers and a student population of nearly 1700, the master scheduling process is not simple. That being said, our administration and teacher participants work diligently to remain within the constraints of facilities and pathways, as well as satisfy student choice of classes.

Central Valley High School Master Schedule:
(Agriculture Department highlighted in pink)

| | | | | | | |
|---|---|---|---|---|---|---|
| LILY-PORTER | Activities | Activities | PREP PERIOD | Renaissance | Leadership | Activities |
| MAGNI | Athletics | PREP PERIOD | DR/Health | DR/Health | Athletics | Athletics |
| | | | | | | |
| CARDOSO | Intro to Animal | Intro to Animal | PREP PERIOD | Ag. Chem | Ag. Chem | Ag. Chem |
| MONCRIEF | ROP AG/ROP Plant | ROP AG/ROP Plant | ROP Plant Prod | PREP PERIOD | ROP Ag Welding | ROP Ag Welding |
| MORTENSEN | Intro to Vet | PREP PERIOD | Intro to Floral | ROP Ag Adv Flor | Intro to Floral | Intro to Floral |
| ROWLEY | Adv. Animal | PREP PERIOD | Ag. Bio | Ag. Bio | Adv. Ag Bio | Ag. Bio |
| TRAINI | Ag Welding | Ag. Intro to Mech | Ag. Intro to Mech | Ag. Intro to Mech | ROP POWER | PREP PERIOD |
| | | | | | | |
| BARKER | PREP PERIOD | Art II/III | World Crafts | Art 1 | Art 1 | Art I |
| COPLEY | PREP PERIOD | Adv. Digital Photo | Computer Graphics | Video Productions | Computer Graphics | Adv. Video Prod. |
| McISAAC | Animation | Art. I | Art I | PREP PERIOD | | |
| JENSEN | Art I | PREP PERIOD | Art I | Art I | Adv. 3D Art | 3D art |
| MILLER | Intro to Engineer | Computer Prog | Engineer 2 | PREP PERIOD | Intro to Engineer | Computer Prog |
| | | | | | | |
| BARTLETT | Pre-AP Eng. 9 | Pre-AP Eng. 9 | Pre-AP Eng. 9 | Pre-AP Eng. 9 | Pre-AP Eng. 9 | PREP PERIOD |
| GROOM | Eng. 9 | Eng. 9 | PREP PERIOD | Eng. 9 | Eng. 9 | Eng. 9 |
| MORENO | Eng. 9 | Eng. 9 | Eng. 9 | Eng. 9 | Eng. 9 | PREP PERIOD |
| MUIRBROOK | Eng. 10 | Eng. 10 | Eng.10 | PREP PERIOD | Eng. 9 | Eng. 9 |
| ELLIOT | Eng. 10 | PREP PERIOD | Expository English | Eng. 10 | Eng. 10 | Eng. 10 |
| OLIVEIRA | PREP PERIOD | Eng. 10 | Eng. 10 | Eng. 10 | Eng. 10 | Eng. 10 |
| GHIMENTI | AP Eng. Lit | AP Eng. Lit | Pre-AP Eng. 10 | Pre-AP Eng. 10 | Pre-AP Eng. 10 | PREP PERIOD |
| FREDRICKSON | Eng. 11 | Eng. 11 | AP Psychology | AP Psychology | PREP PERIOD | AP Psychology |
| GRESHAM | Digital Photo | Digital Photo | AP Language | Digital Photo | PREP PERIOD | Eng. 11 |

| | | | | | | |
|---|---|---|---|---|---|---|
| HOLLIDAY | Eng. 11 | Eng. 11 | Eng. 11 | Eng. 11 | Eng. 11 | PREP PERIOD |
| RILEY | PREP PERIOD | Eng. 11 | Eng. 11 | ROP Newspaper | Eng. 11 | Expository English |
| BELL | Expository English | Expository English | Expository English | Expository English | PREP PERIOD | Yearbook |
| SLEWO | Expository English | Expository English | PREP PERIOD | Expository English | Expository English | Expository English |
| BADILLO | ALD 9th | ELD Support | ELD 2A | ELD 2A | ELD Support | PREP PERIOD |
| | | | | | | |
| ESTRADA | Math I | Math I | PREP PERIOD | Math I | Geometry | Math I |
| BUKKO | Math I | Math I | PREP PERIOD | Math I | Math I | Math I |
| DENG | Alg. II | Math I | PREP PERIOD | Math I | Math I | Alg. II |
| GUEVARA | Math 1 | AP STATS | PREP PERIOD | Math I | AP STATS | Math I |
| AGUILERA | AP CALC | Math II | Math II | Math II | PREP PERIOD | AP CALC |
| MUCHA | Math II | Math II | Math II | Math II | PREP PERIOD | Math II |
| GIL | ACC Math II | Math II | Math II | ACC Math II | PREP PERIOD | Math II |
| OLSEN | Finite Math | Alg. II | Alg. II | PREP PERIOD | Finite Math | Finite Math |
| GOBLIRSCH | Pre-Calc | Pre-Calc | Finite Math | Finite Math | Pre-Calc | PREP PERIOD |
| KANDEEL | Success 101 | ACC Math I | ACC Math 1 | ACC Math 1 | PREP PERIOD | ACC Math I |
| MITRE-LOPEZ | Alg. II | Math I | PREP PERIOD | Alg. II | Alg. II | Alg. II |
| NEVAREZ | Finite Math | Finite Math | Pre-Calc | Pre-Calc | PREP PERIOD | Pre-calc |
| | | | | | | |
| | | | | | | |
| ROHLES | Frosh PE | Frosh PE | Frosh PE | PREP PERIOD | Frosh PE | Frosh PE |
| VAN EGMOND | Health/Dr. ED | Health/Dr.ED | PREP PERIOD | Health/Dr.E D | Frosh PE | Frosh PE |
| DICKSON | PE | PE | PE | PE | PREP PERIOD | ADV. Weight Training |
| EDWARDS | Weight Training | Weight Training | Weight Training | Weight Training | PREP PERIOD | ADV. Weight Training |
| HULST | Dance I | Dance I | Adv. Dance | Dance II | Dance I | PREP PERIOD |
| RODRIGUEZ | Frosh PE | Frosh PE | FROSH PE | FROSH PE | Weight Training | PREP PERIOD |
| | | | | | | |
| HINOJOSA | Guitar I | Guitar I | Concert Band | Percussion | PREP PERIOD | Wind Ensemble |
| Richardson | PREP PERIOD | Choraliers | Concer Choir | Theater Art 1 | Th. Arts II/III/IV | Theater Arts 1 |
| | | | | | | |
| BECK | AP BIO | AP Bio | PREP | APES | APES | APES |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | PERIOD | | | |
| COLBY | Physics | PREP PERIOD | PH Physics | Physics | Physics | Physics |
| Megee | Chemistry | Chemistry | PREP PERIOD | CHS | CHS | CHS |
| MELO | PREP PERIOD | Anat/Phys | Anat/Phys | Anat/Phys | Anat/Phys | Anat/Phys |
| REYNOLDS | Bio | PREP PERIOD | Bio | Bio | Bio | Bio |
| ROWELL | Success 101 | PREP PERIOD | Bio | Bio | Bio | Bio |
| SELFRIDGE | Bio | PREP PERIOD | Bio | Bio | Chem | Chem |
| WISE | AP CHEM | PREP PERIOD | Adv. Bio | Adv. Bio | Adv. Bio | Adv. Bio |
| STONE | Adv. Chem | Adv. Chem | Chem | Chem | Chem | PREP PERIOD |
| VALLIN | Chem | Chem | Chem | PREP PERIOD | Chem | Chem |
| | | | | | | |
| JONES | Econ/Gov | Econ/Gov | Econ/Gov | Econ/Gov | PREP PERIOD | Econ/Gov |
| PIERCE | Gov/Econ | Gov/Econ | Gov/Econ | PREP PERIOD | Gov/Econ | Gov/Econ |
| BARRON | PREP PERIOD | World History | World History | Gov/Econ | World History | World History |
| MERCHANT | World History | PREP PERIOD | World History | World History | World History | World History |
| MICKELSON | World History | World History | AP US | AP US | AP US | PREP PERIOD |
| RICHARDS | PREP PERIOD | US History | US History | Interventions Lead | AP Government | AP Government |
| SKAVDAHL | US History | US History | US History | AP European | US History | AP European |
| NAVA | US History | PREP PERIOD | US History | US History | US History | US History |
| | | | | | | |
| BRIONES | Spanish II | Spanish III | Spanish II | Spanish II | Spanish III | PREP PERIOD |
| GASCA | Spanish I | Spanish I | Spanish I | Spanish II | Spanish II | Spanish I |
| GARCIA MARTINEZ | Spanish II | Spanish II | Spanish I | Spanish I | Spanish I | Spanish I |
| GOMEZ | Sp. Spk II | Sp. Spk II | Spanish II | PREP PERIOD | Spanish II | Spanish II |
| LEON | Sp. Spk II | Sp. Spk II | Sp. Spk II | Sp. Spk. III | Sp. Spk. III | Sp. Spk II |
| MARTINEZ | PREP PERIOD | AP Span Lit. | AP Span. Lang | AP Span. Lang | AP Span. Lang | Sp. Spk. III |
| | | | | | | |
| BOSCH | Math IB | Math IB | Math 1A | PREP PERIOD | Math Ess I | Math 1A |
| DeSOUZA | Eng. 9 PI(Moreno) | Learning Center | Learning Center | Math I PI (Estrada) | Eng. 9 Support | PREP PERIOD |
| HENDERSON | Eng. I Ess | Eng. I Ess. | Eng II Ess | PREP PERIOD | Eng II Ess | Learning Center |
| NUSS | Math Ess/Math IA | Phys Sci Fund. | Gov/World Fund | Eng. Fund (9,10) | Eng. Fund (11,12) | Success 101 |
| REYNOLDS, M. | Math I PI (Guevara) | Math II PI(Aguilera) | Math II PI(Aguilera) | Eng. 12 PI(Bell) | PREP PERIOD | Eng. 12 Support |
| WAGNER | Learning Center | Eng. 10 PI(Muirbrook) | PREP PERIOD | Learning Center | Eng. 10 Support | Math 1 PI(Guevara) |
| WEJMAR | World HIst Ess | LIfe Sci Ess | World Hist Ess | Civics Ess | Life Sci Ess | PREP PERIOD |

| | | | | | | |
|---|---|---|---|---|---|---|
| BOYINGTON | | | | | Eng. 11 PI(Riley) | Eng 11 Support |

**1E. Agriculture Career Awareness information is included in every course**

Every course in the Agriculture Department includes a unit on agriculture careers. For most of the lower grade classes, a careers unit is incorporated into second semester. Our capstone courses of ROP Welding and Fabrication, ROP Advanced Floriculture, ROP Plant Production, and Vet Science, as well as our heavily 11$^{th}$ and 12$^{th}$ grade courses of Ag Welding and Animal Science, participate in a career readiness unit that includes developing a career portfolio and a mock job interview.

We have also developed partnerships with local businesses and will be working to provide career exploration and internship for all pathways. We already utilize speakers or business field trips. The focus now will be funneling student experiences into internship or job shadowing where possible.

**1F. The agriculture department utilizes computer hardware and software as an instructional tool.**

All teachers at the Central Valley have access to personal computers and LCD projectors for instructional use. Within the agriculture department, we also have 2 document cameras to use for instruction. Additionally, there is a plasma cam and CNC router with accompanying software that is utilized within our ag mechanics pathway courses. Our campus has also transitioned recently into Google Classroom for every class along with Google Drive and Turnitin.com. Every student on campus has their own personal Chromebook starting this year, so there has been a large focus on increasing use of technology in our instruction.

**1G. The agriculture curriculum includes the use of computer aided instruction by utilizing at least one of the following:**

- **Computerized Record book**
- **Agriculture Term paper**
- **Job resume**
- **Portfolio Letter of Introduction**
- **Agriscience Fair Report**
- **Agriculture/ FFA Speech**
- **Job Cover Letter**
- **Other Agriculture Related Project**

As previously stated, Animal Science, Vet Science, ROP Plant Production, Ag Welding, ROP Welding, and ROP Advanced Floriculture all produce resumes, cover letters, and career porfolios as part of their career readiness unit. All Ag chemistry and Advanced Ag biology students complete and Agriscience Fair report as well as present their findings in the form of an oral speech to school administrators. Every agriculture class utilizes record books however, this year with the access of every student to iRecord books through their Chromebooks, all classes will include iRecord book units.

**1H. Record Keeping is taught in all agriculture classes. Every student maintains and completes either and actual SAE project or Mock Problem.**

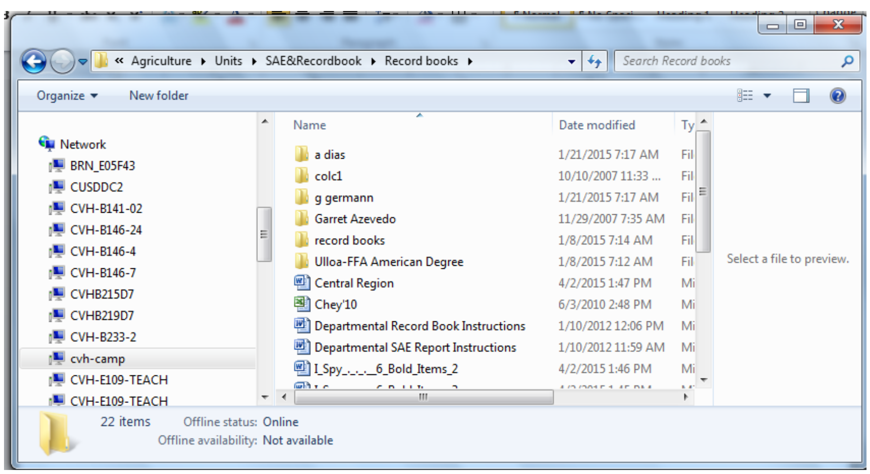
All classes teach use of the California FFA Record Book. Most classes begin record keeping units in January and books are maintained through the following December. An up to date record book contributes to 10% of the students' grade.

Consistency in record keeping lessons and maintenance has been a recognized shortcoming of the department. Over the summer of 2015, all 5 members of our department participated in an SAE and record book focus workshop with the goal of developing a department SAE portfolio project and iRecord book lessons. Starting in January, all agriculture students will develop and SAE proposal, implement or continue their project, and finally develop a report due at the end of the semester which will include up to date iRecord book entries. Previously, all students were expected to have an SAE project but teaching, monitoring, and maintenance of SAEs were widely varied from teacher to teacher. This will standardize the expectations and evaluation for SAEs regardless of teacher or course.

**1I. Record books of all students are maintained in the Department files until one year following graduation.**

Prior to the addition of Chromebooks, all student paper record books were maintained for 2 years after graduation. Paper books from more than 1 year ago are boxed based on year and stored in our department storage container. Previous year's books are kept in teacher classrooms to facilitate students locating their book in the new school year.

Students pursuing State Degrees are encouraged to convert their books to e-record books as soon as possible. Those students' record books are stored on the department hard drive for at least 2 years for purposes of American Degree applications.




Department e-record book storage

**1J. Agriculture courses have been submitted to meet high school graduation requirements and/ or University of California a-g credit.**

All agriculture courses meet the requirements for high school graduation and many are UC/CSU a-g approved courses. Ag Biology, Advanced Ag Biology, and Ag Chemistry are approved for Area D lab science credit. Advanced Floriculture receives fine art credit. Also, Intro to Animal Agriculture, Animal Science, and Vet Science all receive college prep (Area G) elective credit.

# Quality Criteria Two

**2A. An FFA Chapter has been chartered by the State Association or has been applied for.**

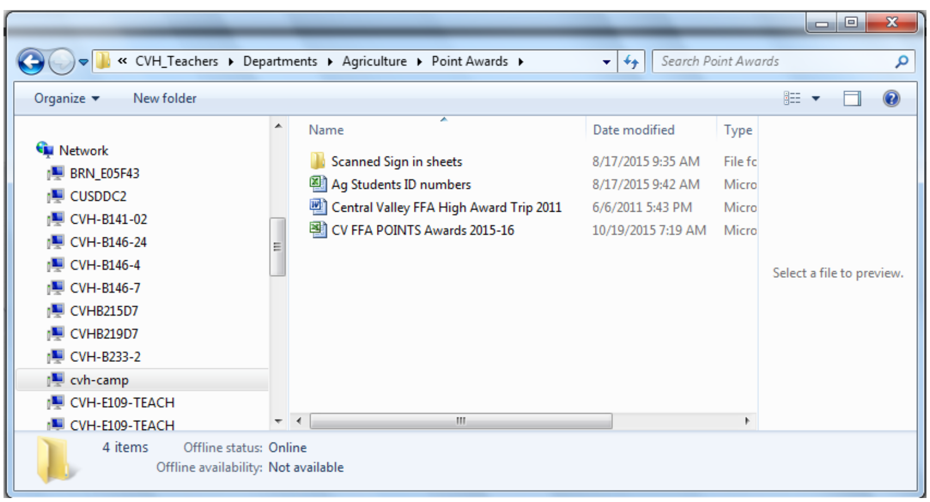
Central Valley- Ceres FFA Chapter is chapter number 531 and was chartered in 2005.

**2B. A Chapter Program of Work is developed annually and a copy is furnished to the Regional Supervisor by December 15th.**

Central Valley established its Program of Work in 2006. It has been revised every year by the chapter officers and is provided to the Regional Supervisor updated each fall. The most current Program of Work is included in Appendix A.

**2C. Every student is given a grade based upon participation in leadership activities.**

Every student in an agriculture class is expected to participate in at least 4 FFA activities a semester. Students with more than one agriculture class in the same term will not be required to participate in 4 activities per class. Their participation accounts for 10% of their total grade for the course. Points are recorded based on student sign in sheets from FFA activities. Sign in sheets are scanned and saved in the department hard drive for calculation of point awards at the end of the school year.




Department student participation records

**Tests = 40%**
**Notebook and assignments = 50%**
**FFA Participation/ Record Book = 10%**

Each teacher has a different break down but FFA and Record books are always 10%.

**2D. All students enrolled in agriculture classes are affiliated with the State FFA Association.**

All students in ag courses are affiliated with National FFA via the R-2 reports submitted to the California State FFA Association each fall by October 15th.

**2E. Based on previous year's records, the department participated in a minimum of 12 activities as listed on the FFA Activities Check Sheet.**

Based on last year's record Central Valley FFA participated in the following activities:

- Greenhand Leadership Conference
- Advanced Leadership Academy
- Chapter Officer Leadership Conference
- Spring Regional Meeting
- State Leadership Conference
- Submitted State Degrees
- Submitted American Degrees
- Submitted Scholarship Applications
- Participated in Opening Closing Competiton
- Participated in Job Interview
- Competed in Parlimentary Procedure
- Competed in multiple species and events at the Stanislaus County Fair
- Participated in Tri Rivers sectional volleyball
- Competed at multiple field days and state finals in the following CDE teams:
    - Farm Business Management
    - Horse Judging
    - Poultry Judging
    - Floriculture
    - Dairy Cattle Evaluation

# Quality Criteria Three

**3A. Student Participation in Supervised Agricultural Experience (SAE) is part of the grading criteria for every agriculture student in the program.**

Every student at Central Valley is graded on their SAE projects. In addition, every student completes an SAE portfolio project during the spring semester which is a graded component of each course. SAE, along with recordbook proof accounts for 10% of a student's class grade.

**3B. First year students have either been engaged in a SAE project(s) or have a plan in place for a SAE, as verified by the Student Data- Career Plan.**

All students complete their SAE Portfolios in the spring which includes answering questions on what their focused pathway is or will be and what their plans for the SAE project will be continuing on into their high school career and beyond. We have found that by developing a solid foundation with first year student in SAEs, that their continued involvement and achievement in SAEs, FFA degrees, and FFA competition has increased.

**3C. A minimum of 80% of continuing students are engaged in SAE projects as verified by department records.**

This number has greatly improved in the past 2 years with the addition of the department wide SAE Portfolio Project. This allows us to verify each student's participation in SAE, and allows us to support students who want to grow their skills and achievement with their SAE.

Prior to the addition of the SAE portfolio, the students could be verified by competing in county fair animal projects or plant projects as well as through individual teacher evaluation for class grades. This project standardizes not only the expectation but also the evaluation of SAEs. Teachers collaborated on rubric development and assignment components. They then use that reported data to develop new opportunities for student SAE projects.

Two of the additions to our students' SAE opportunities have been the Central Valley Rabbitry Cooperative and the Ceres Ag Center Pumpkin project. Both cooperative engage about 10-12 students each. They are directly supervised by the ag teachers and students make all of the management decisions. Profits from the sale of the products are split between project members. Activities like these educate students that SAE projects are not just about raising animals for fair.

**3D. Students with SAE projects are visited by their agriculture teacher at least twice per year as documented by department records.**

Central Valley FFA has a high student to teacher ratio with well over 500 students. This makes individually visiting all FFA projects difficult. We are fortunate to have many different facilities that allow students to keep their SAE project on campus or at school facilities. Students will market animal or breeding projects get visited 2-10 times a year depending on need. Students with plant production projects are visited 2-4 times per year depending on location and need. As of yet, there is standardized common SAE documentation form. All ag teachers use a combination of notebooks, binders, or iPad to record SAE visits. Overall, with the improvements to SAE projects by developing a common SAE Portfolio Project, we will be looking into creating a common SAE visitation form, possibly via Google Forms, to track visits.

**3E. A school vehicle is readily available to each agriculture teacher for all SAE activities associated with the program, or each teacher is adequately compensated for using their own personal vehicle.**

Ceres Unified School District provides both a 9 passenger van and a 6 passenger pick-up for use by ag teachers at any time. All ag teachers possess keys to the vehicles and gas cars to fuel up when needed. Teachers at Ceres High and Central Valley use Microsoft Outlook calendar invites to book use of the vehicles. We also have one 16 ft. gooseneck stock trailer and one 12 ft. bumper pull stock trailer that can be used for SAE visits or transportation of student project to the Stanislaus County Fair, State Fair, local or regional competitions, or Occupational Olympics.

With the influx of new Grant money via the CCPT grants, Ceres Unified is looking to purchase an additional ag pick-up and an additional ag van or multi-person vehicle for use by both agriculture departments.

# Quality Criteria Four

**4A. Every agriculture teacher has the appropriate credential for teaching the subject(s) assigned. Copy of authorizing credential(s) is in the Comprehensive Program Plan.**

All five agriculture teachers at Central Valley possess clear single subject credentials and ag specialist credentials necessary to teach agriculture education. A copy of their credential can be found in the Comprehensive Plan.

**4B. Based on previous year's records, every agriculture teacher, teaching at least ½ time agriculture, attends a minimum of four professional development activities.**

Central Valley ag teachers are very involved in professional development. Not only do they participate in CATA professional activities, but also BTSA, CTA, NAAE, and Ceres Unified professional development. Through district board policy, teachers are only allowed to use 6 days of out of classroom professional development a year. Luckily, many of the events are after school or on weekends. Some of activities that Central Valley teachers routinely attend are Sectional CATA meetings, Sectional Industry Tours, Regional Road Show, and Skills Courses.

**4C. The agriculture staff meets a minimum of twice a month.**

The agriculture department has always met at least twice a month as a department and multiple times through email, phone calls or group texts. In 2013, as a department we recognized the need to meet more often to maximize productivity of our chapter. We instituted a standing Monday department meeting at 3 pm or immediately following a staff meeting. The only exception is Mondays that holidays and vacations. We have a standing meeting location and meeting normal that we prescribe to.

**4D. A written record of minutes is kept of action taken during agriculture staff meetings and is kept in Department files or the Comprehensive Program Plan.**

Meeting minutes were recorded by individual staff members however within the past 3 years, written records in the form of word documents and, this year, google docs, have taken place. Past meeting minutes are located in the department hard drive and current year minutes are located in the department google drive shared file.

**4E. Teachers are reimbursed for personal expenses they incur while participating in all approved integral activities associated with FFA, SAE, and professional CATA in-service activities.**

All ag teachers are reimbursed for activities associated with FFA, SAE, and CATA. For most activities meals, hotels, transportation, and parking are paid for using department funding. Teachers are asked to send in registration and fill out a conference expense for prior to leaving.

Meals, parking, transportation, and registration are typically prepaid. If required, teachers will turn receipts of purchases into the school secretary for reimbursement.

# Quality Criteria Five

**5A. Modification of facilities and equipment has occurred when necessary, based on the needs of students, including special populations.**

Central Valley High School has extremely good facilities that are maintained regularly by the agriculture staff or the district. The original ag department built in 2005 was a single room and small storage area. Agriscience classes were taught out of the main science building on campus. Quickly, a multi-million dollar shop was built including 2 classrooms each connected to a shop laboratory. One shop was built with the focus on ag mechanics and welding; the other was focus on power mechanics. Also built were 2 60 x 30 ft. automated greenhouses for use in the plant science courses. Students constructed the shade house outside one of the greenhouses. A large 12 x 12ft. floral cooler was also added to the department.

In 2011, after a group of students raised chickens for an agriscience fair project that ultimately won at the National FFA Convention, donations from Foster Farms were used to build a small animal unit on the Central Valley High School campus. Previously all poultry and rabbit facilities were located at Ceres High and students had to travel there to conduct their projects. Today the facility is used year round to support the animal science courses and houses our rabbitry co-op and poultry co-op.

The next year a hydroponics greenhouse was added to the ag department using recycled materials from Ceres High to supplement both the new ag chemistry course and the plant production courses. The greenhouse grows lettuce and cucumbers during the school year which are harvested for school lunches.

Also in 2012, Ceres Unified School District approach the ag teachers within the district with a proposal to convert 6.5 acres of fallow land owned by the district into a district farm. The purpose was grow crops on the farm to provide fresh produce for school lunches in the district. Since that time, the ag teachers and students at Central Valley have added irrigation, planted over 100 fruit trees, 200 table grapes, blueberries, strawberries, seasonal vegetables, citrus trees, and pumpkins. We have secured funding to build a 3000 sq. ft. vegetable processing unit and shop to store tools and equipment. It is the intention of the district to add animal housing for sheep, goats, cattle, and hogs soon.

**5B. There is adequate storage space for materials, records, equipment and supplies.**

Storage and organization are always goals and room for improvement in ag education. The ag department uses 5 classrooms, 2 shops, and teaches 26 sections of students a day. Each classroom has storage unique to its location. Science classrooms have cabinets and storage rooms for supplies, materials, and records. The ag mechanics shop classes have storage for classroom materials, lockers for each student, and a sea-train storage container for project materials. The power mechanics shop also has lockable tall cabinets for fastener and tool storage. The floral classroom has a storage room attached to the classroom with two 8 ft coolers and the external walk in cooler. The plant science classes use both the vegetable processing unit as storage and the greenhouse storage for their tools and equipment.

**5C. At least one of the below listed community or school based laboratory facilities has been provided to accommodate students who have no place for their SAE project(s):**

- **School Farm Laboratory**
- **Growing Area**
- **Greenhouse**
- **Agriculture Shop**

Central Valley uses all of the above facilities for student SAE projects. There are 2 farm facilities used by students. One serves as an animal facility and is used seasonally for market animal projects and year round for breeding projects. The other is the district farm which grows crops and has been used for large agriscience fair trials. There are multiple growing areas used by students. In addition to the greenhouses and district farm, individual growing plot are used for personal SAE gardens. The 2 shops have produced large and small SAE projects, from candle holders to full sized utility trailers.

**5D. The Agriculture Department has e-mail capabilities.**

All agriculture teachers readily use email via Microsoft Outlook and gmail. Emails are the main form of communication with other teachers and staff on campus as well as with other teachers around the state.

**5E. The reviewer verifies by visual observation that the agriculture facilities are neat, clean, and orderly.**

Twice a year facilities are evaluated by district administrators. Agriculture teachers clean and reorganize shops, classrooms, and storage at least annually.

**5F. Facilities and equipment are regularly maintained, repaired, or replaced.**

The Ceres Unified School District maintenance department aids ag teachers in maintaining all equipment, facilities and vehicles. Ag teachers are expected to repair and maintain tools. They are also responsible for inspecting all equipment before students use them. Safety inspector evaluate facilities annually and appropriate changes are made. Finally, the ag department and advisory committee make a plan for equipment replacement and acquisition annually.

# Quality Criteria Six

**6A. The Advisory Committee is operational and reflects the committee membership as outlined in the "Agricultural Education Advisory Committee Manual".**

The Advisory committee has evolved over the past 4 years. Previously, our advisory committee was small and really lacked direction for each meeting. 4 years ago we expanded the advisory committee to include professionals in the local agriculture industry in order to help guide planning for the new Ceres Ag Center. The advisory members have since helped not only with planning the buildings and facilities but also with community involvement and course additions as our program grows.

**6B. The Agricultural Advisory Committee meets at least twice a year.**

The advisory committee meets once in the fall and once in the spring. We are currently in the process of developing clear topic targets for the fall meetings and the spring meetings that will be addressed every year.

**6C. The Agricultural Advisory Committee has assisted in the development or revision of the following components of the Comprehensive Program Plan, as evidenced in the Ag. Adviosry Committee minutes**

- **Job Market Description**
- **Total Program Goals & Objectives**
- **Course Subject Matter Outlines**
- **5 Year Facility & Equipment Acquisition**
- **Graduate Follow up**
- **Targeted Occupations**
- **Program Description- Courses, SAE, FFA**
- **Program Completion Standards**
- **Current Year Budget**
- **List of Active Placement Sites**

Our committee has always provided feedback and guidance on program goals and objectives, facility and equipment aquistition, targeted occupations, and budget. With our improvement of the advisory committee objectives, we will be looking to address all these components in the meetings this year.

**6D. The contact information of the Advisory Committee Chair has been provided on the cover of this checklist.**

Our committee chair is Dave Brown, a local farmer and former school board member. His contact information is included in the advisory board contact list.

# Quality Criteria Seven

**7A. Students are counseled regarding:**

- **Career opportunities in Agriculture and Agribusiness**
- **Agriculture and academic courses necessary to complete career pathway offerings**
- **Post-secondary education and training options.**

We have a huge focus at Central Valley on helping students find a career focus. The high school itself has a central goal of every student being college and career ready.

Every course taught in the ag department includes a unit on agriculture careers related to that pathway. There is an established emphasis for introduction classes to provide a general career base on all agriculture careers and majors, especially those related to the pathway that course is a part of. As student progress the career counseling becomes more concentrated on job shadowing and post-secondary internships in the related career field.

For the past year, we have been working as a department on establishing industry links and sponsorships with major agricultural businesses in the area to supply mentors, job shadowing and internships for our students. Currently, our partners include Stanislaus Farm Supply and Gallo Winery/ G3 Enterprises. We are working on establishing a partnership with Foster Farms, a local florist company, and 2 local veterinary hospitals.

Students are routinely given the opportunity to tour colleges and training centers for post-secondary education. Some of the tours are provided as part of their class and some is aligned with career development events or leadership conferences. The counseling department at Central Valley organizes a college tour for all freshmen students in the fall, as well as counseling all students in January about career options and college majors. The ag department teams with the counselors to give relevant career and college data related to agriculture careers and career options.

Recently, our district administration met with the agriculture teachers from both Central Valley and Ceres High to discuss use of the CCPT and CTE Incentive grant money to strengthen the career counseling provided for agriculture students. The goal would also be to develop an improved tracking system to provide data on student success and graduate follow-up.

**7B. All students have a completed career plan (Student Data Sheet) and it is updated annually.**

The counselors at Central Valley complete and update a career plan for every student each year. Plans are stored in the district server and are accessible to all students for the duration of their high school career.

The agriculture department is in the process of developing an electronic student data sheet that can be accessed by the ag department to aide in specific career counseling. This data sheet will be implemented in all ag classes beginning January 2016.

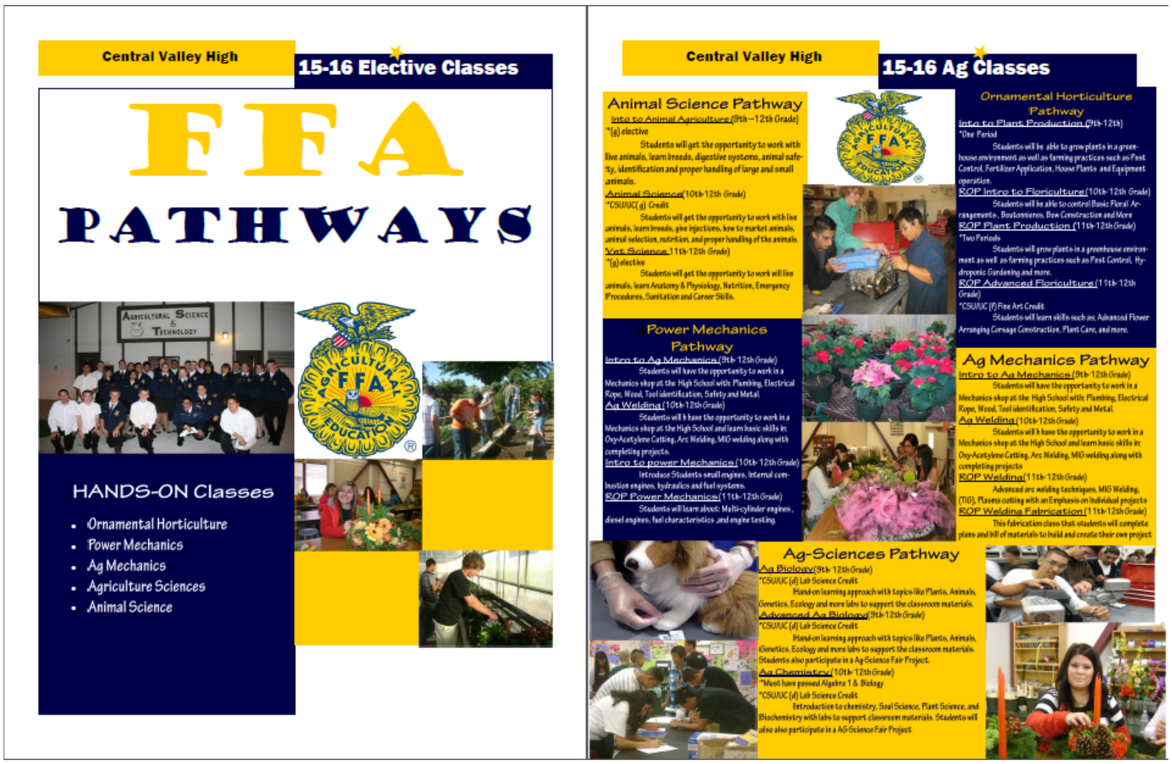
**7C. Efforts have been made, or completed, to articulate with Community College and/or Universities.**

Previously, Central Valley had 2 pathways aligned with Modesto Junior College Agriculture Department. Introduction and Advanced Floriculture, as well as, Animal Science and Vet Science were aligned with MJC via a 2+2 agreement. Due to staffing changes, contracts were in valid. Additionally, based on student enrollment data, there was little draw for students to take both classes in order to get MJC credit. Graduate students informed us that their credit did not help them progress faster through their degree at MJC. However, MJC has changed their articulation to include fully articulated courses where students can get college credit for entry level courses if they pass a final exam approved by the MJC professor of the course. Central Valley agriculture department is currently pursuing an articulations agreement for Advanced Floriculture and Vet Science. We will be looking to add Advanced Power Mechanics and Animal Science to that list next year.

# Quality Criteria Eight

**8A. An Agricultural Education program recruitment brochure or similar document is used to promote the program.**

A department flyer is distributed every December/ January by our counseling department that is designed by the agriculture department. The flyer is mailed home before balloting by students in January along with flyers from other departments on campus and counseling information.




**8B. Students have alternative means of overcoming financial barriers to participate in program activities.**

We constantly communicate to students that the only thing that will prevent them from participating in all that the ag department has to offer is their willingness to participate. We have many resources to help students overcome limitations that might prevent them from fully participating in FFA and SAE activities.

The chapter maintains 20 chapter FFA jackets that can be checked out by students for FFA activities and SAE competitions such as the Stanislaus County Fair. There is also an active Ag Boosters which provide jacket scholarships for the winner our local creed speaking competition, as well as for students that petition for booster support. Additionally, our boosters donated a chapter jacket set of 10 jackets last year for use by all students. The biggest need for jackets is during Opening Closing Competition in the fall and during Stanislaus County Fair in the summer.

For SAE projects, American Ag Credit works with local FFA chapters and students to provide no interest loans for market projects. Our students use this service extensively. Typically 50% more of our livestock competitors take advantage of the loan service for at least the first year of participation. Many students are able to use the profit from their first couple years of competition to fund their market project in the following years.

In terms of FFA leadership conferences, the FFA chapter fundraises throughout the year to alleviate the cost of State Convention, MFE/ ALA, and Greenhand Conference. The chapter pays the entire cost for 15 greenhands to attend conference. We pay a quarter of the conference cost for all MFE/ ALA participants. The chapter also pays for 100% of State Convention costs for both chapter delegates who are selected from applicants based on leadership or chapter participation and financial need.

**8C. The Agriculture Department conducts recruitment activities with local feeder schools.**

Central Valley High School draws students from both Blaker Kinser Junior High and Cesar Chavez Junior High, both of which offer agriculture class electives. Recent redistribution of students has moved a higher percentage of Chavez students to Central Valley than in years past. Previously, the ag department presented about ag classes to Blaker students when they visited the high school before balloting. We also worked with the Blaker Junior Leaders in Agriculture club out at the Ceres Ag Center and with county fair plants and vegetables.
Beginning in 2014, we initiated recruitment lessons taught by Central Valley ag teachers and agriculture students to Blaker Kinser agriculture classes. Four lessons were taught over 5 months including: introduction to California agriculture and leadership, ag mechanics (sheet metal), floriculture, and plant production. These lessons significantly increased freshmen balloting for agriculture classes both from the experience and work-of-mouth promotion.
Our goal for next year is to expand this recruitment to Cesar Chavez Junior High agriculture classes as well.

# Quality Criteria Nine

**9A. A Comprehensive Program Plan is on file with the Regional Supervisor and a copy is retained in the local department files.**

I took over as department head at Central Valley Ag department last year. That was my first year completing the Ag Incentive Grant and we did not have program reviews at the time. At the end of that year, my former department head handed me a large stack of binders and said this was for Incentive Grant Review. Once opened, it was apparent that these are guide lines for program plans, not Central Valley's actual program plan.
Due to the lack of program visits, I believe the program plan binder was lost and based on my research may have been largely incomplete as it was. Through the process of completing my binder for AGED 539 I believe I have developed a very functional Comprehensive Program Plan. This will be very useful next year when we will be visited by the Regional Supervisor for an Ag Incentive Grant Review.

**9B. Updates of the Program Plan are sent to the Regional Supervisor by November 15th. These updates include: Five year Equipment Acquisition Schedule; Chart of Staff Responsibilities; FFA Program of Work; Advisory Committee Roster; and Advisory Committee Minutes.**

All required items have always been updated and sent to the regional supervisor. However, since I began as department head we have updated these documents together as a department and taken joint ownership of the advisory committee.

**9C. The follow up system is used which gathers the following information from program completers:**

- **Status of employment or school enrolled within**
- **Opinion regarding the value and relevance of the agriculture program**
- **Suggestions for improving the agriculture program**

Currently, no mechanism exists to collect this data from students. Graduate follow ups have been largely based on teacher knowledge and filled out in the fall.
Resulting from our own internal department evaluate in the summer of 2015, Central Valley will now have a graduate survey via google forms to be completed in May each year. The survey will include future plans for employment and college, a rating of agriculture courses taken, and suggestions for improving the agriculture program in the future.

**9D. The Graduate Follow-up data collected was entered with the Online R2/ FFA Roster Data Entry by October 15th.**

As previously stated, graduate data was collected in September based on ag teacher knowledge of student situations. This is a very inefficient method of surveying and reporting on our students. We will be incorporating a google form survey this year to have a more accurate report.

**9E. The Agriculture Department analyzes their student retention numbers each year and develops strategies to help increase retention within the program.**

This has been an essential focus for the agriculture department for the past 4 years. Our original issue based on R-2 numbers was the literal loss of sophomore ag students. This was largely due to required courses students needed for high school and college eligibility and there being no room in the student's schedule for elective courses. After research, Ag Chemistry was settled on as a viable required course we could offer to increase sophomore participation in FFA and agriculture classes. Since offering the class 4 years ago, our number of program completers has doubled, state degrees have almost tripled, we have had an American degree recipient every year, MFE and ALA conference participation has grown from 2-3 students to 12-15, and the overall quality of agriculturally focused students has increased.
Now our focus is on retention of students within focused career pathways. Based on previous year's data, our percentage of freshmen persistence 3 and 4 year students has increased 3% and 4% respectively. 2 years ago we collaborated as a department on expected course outcomes to ensure our courses were streaming into each other without overlap or gaps. Last year we focused on strengthening freshmen recruitment and added Introduction to Animal Agriculture to create a full Animal Science pathway. This year we added Ag Leadership as a zero period option students that still could not fit agriculture classes into their schedule. Next year, we will be expanding our pathways to 4 with a solid Agriscience pathway. This pathway will include the new UCCI approved courses of Sustainable Agriculture Biology, Agriculture and Soil Chemistry, and Agriculture Systems Management. It will have a capstone course addition of Food Science. We will analyze our course enrollment numbers in the spring as an initial assessment of this retention effort. Later in the fall we will look at R-2 retention numbers compared to this year.

**Agriculture Department Pathways**
**Expected Outcomes**

**<u>Ag Mechanics Pathway</u>**
**Intro to Ag Mechanics**

1. FFA and California Agriculture
2. Measurement
3. Tool ID
4. Shop safety/ procedures
5. Tie 8 knots and 3 splices
6. Sheet metal layout and fabrication
7. Pipe joints for steel, copper, and PVC and common fittings used
8. Fabrication of cold metal and fasteners used to join them
9. Wiring a basic circuit and principle of electricity
10. Wood layout and fabrication of wood joints
11. Basic plan reading
12. Basic bill of materials
13. Basic layout
14. Introduction to welding

**Intro to Ag Welding**

1. Demonstrate safe shop procedures and machinery operation.
2. Apply oxy-acetylene cutting theory to cut, pierce, and bevel steel.
3. Safely set-up and cut using the plasma arc machine.
4. Set-up, adjust, and weld correctly using SMAW in the flat and vertical positions using 6011,6013, and 7018 rods.
5. Set-up, adjust, and weld correctly using GMAW in the flat and vertical positions.
6. Properly layout and cut using CAD plans.
7. Fabricate a project that is structurally square and stable.
8. Create a bill of materials after project completion.

**ROP Welding**

1. Apply SMAW out of position using 6011 7018
2. Apply GMAW out of position
3. Set-up, adjust, and weld using TIG welding
4. Apply metal processing of oxy-acetylene and plasma to cut metal
5. Demonstrate project construction and structural design principles

**ROP Welding Fabrication**

1. Construct projects using SMAW, GMAW, TIG, and Oxy- Acetylene welding

**<u>Power Mechanics Pathway</u>**

**Intro to Ag Mechanics**

1. FFA and California Agriculture
2. Measurement
3. Tool ID
4. Shop safety/ procedures
5. Tie 8 knots and 3 splices
6. Sheet metal layout and fabrication
7. Pipe joints for steel, copper, and PVC and common fittings used
8. Fabrication of cold metal and fasteners used to join them
9. Wiring a basic circuit and principle of electricity
10. Wood layout and fabrication of wood joints
11. Basic plan reading
12. Basic bill of materials
13. Basic layout

**Intro to Ag Welding**

1. Demonstrate safe shop procedures and machinery operation.
2. Apply oxy-acetylene cutting theory to cut, pierce, and bevel steel.
3. Safely set-up and cut using the plasma arc machine.
4. Set-up, adjust, and weld correctly using SMAW in the flat and vertical positions using 6011,6013, and 7018 rods.
5. Set-up, adjust, and weld correctly using GMAW in the flat and vertical positions.

6. Properly layout and cut using CAD plans.
7. Fabricate a project that is structurally square and stable.
8. Create a bill of materials after project completion.

**Intro to Power Mechanics**
1. Use Micrometers
2. 3 engine systems: ignition, carburetion, compression
3. Torque
4. Read technical writing
5. Basic parts ID
6. Use manual to look up part numbers
7. Basic tool ID
8. Basic cold metal fabrication
9. Basic engine overhaul

**ROP Power Mechanics**
1. Perform a complete engine overhaul
2. Look up part numbers using the mechanics manual
3. Complete work orders
4. Engine diagnostics and trouble shooting
5. Advanced tool ID
6. Basic part fabrication
7. Use diagnostic equipment
8. Use torch wrench

**Ornamental Horticulture**

**Intro to Plant Production**
1. FFA and California Agriculture
2. Equipment safety
3. Plant propagation- sexual and asexual
4. Plant nutrition- macro and micro nutrients, organic and inorganic
5. Weed Control and identification- cultural and chemical
6. Pest Control and ID- organic and inorganic methods
7. Plant management- pruning, training, and harvest
8. Safe food handling- harvest, production, process, and storage
9. Disease control- prevention and treatment

**ROP Intro to Floriculture**
1. FFA and California Agriculture
2. Safe handling of floral sheers and knife
3. Identify 20 flowers, 20 potted plants, 20 tools
4. Construct a boutonnière
5. Construct a corsage
6. Construct a centerpiece arrangement
7. Complete a floral arrangement price sheet

8. Understand color concepts

**Advanced Plant Production**
1. Equipment operation- cultivate, bed preparation, mower, edger, blower
2. Apply Plant propagation- sexual and asexual
3. Apply Plant nutrition- macro and micro nutrients, organic and inorganic
4. Apply Weed Control and identification- cultural and chemical
5. Apply Pest Control and ID- organic and inorganic methods
6. Apply Plant management- pruning, training, and harvest
7. Apply Safe food handling- harvest, production, process, and storage
8. Apply Disease control- prevention and treatment

**ROP Ag Advanced Floriculture**
1. Safely handle tools
2. Identify all cut flowers, potted plants, and tools
3. Construct various artistic arrangements
4. Apply color concepts
5. Contemporary design styles and techniques
6. Complete retail and labor cost sheets
7. Peer and self analyze arrangements
8. Understand historical and cultural theory
9. Evaluate floral artwork

**<u>Animal Science Pathway</u>**

**Intro to Animal Agriculture**
1. FFA and California Agriculture
2. Breeds- beef, sheep, swine, horse, chickens, dairy, dairy goats
3. Terminology
4. Digestive systems- ruminant, mono-gastric, and poultry
5. Grooming
6. Housing and equipment
7. Animal safety
8. Segments of the livestock industry
9. California agriculture and meats
10. Restraints
11. Animal identification
12. Basic external anatomy

**Animal Science**
1. Digestive systems and processes
2. Injection types- IM, IV, IR, Subcutaneous, intradermal
3. Animal Marketing- meat, mohair, wool, by products
4. Selection of animals
5. Showing
6. Basic animal husbandry

7. Nutrition and feeding
8. Reproduction and breeding
9. Genetics

**Vet Science**

1. Diseases of Livestock
2. Ethics and ethical treatment of public animals
3. Administration of medications
4. Medical examinations/ wound management
5. Fecal and urine samples
6. Anatomy and physiology
7. Animal behaviors
8. Surgical Instruments

**<u>Agriculture Sciences</u>**

**Ag Chemistry**

1. Know the parts of the atom, its density, and how atoms are arranged on the periodic table
2. Know chemical bonding and how it applies to chemical reactions
3. Be able to balance chemical equations
4. Apply gas laws to specific situations
5. Understand principles of solutions and molarity for purposes of developing different concentrations
6. Apply acid and base knowledge to solutions for plant and animal health
7. Know nuclear chemistry and how matter affects it
8. Apply biochemistry to food production
9. Agriscience Fair emphasis on experimental design

**Ag Biology**

1. Cell organization and processes
2. Reproduction of plants and animals
3. Genetics
4. Evolution
5. Physiology of plants and animals
6. Ecology
7. Investigation and experimentation

**Advanced Ag Biology**

1. Agriscience Fair emphasis on experimental design
2. Cell organization and processes
3. Reproduction of plants and animals
4. Genetics
5. Evolution
6. Physiology of plants and animals
7. Ecology
8. Investigation and experimentation

**9F. The R-2, AIG Expenditure Reports, and FFA Roster have been received by the Regional Supervisor and/or State FFA Financial Coordinator on or before October 15th.**

The expenditure reports, R-2, and FFA roster materials are all set to the regional supervisor by October 15th.

# Quality Criteria Ten

**10A. Shop and Laboratory-based classes have no more than 20 students enrolled. Classroom based classes have no more than 25 students enrolled.**

This is a quality criterion we have not been able to convince our administration to support. We have one room in the ag department that cannot physically hold more than 25 students. All classes taught in that room have 25 or fewer students. All other classes taught in the ag department have a class average of 31 students per class. Next year, we are expecting with the addition of the new courses to add another ag teacher to the department and for class sizes to drop.

**10B. The total number of students enrolled in agriculture classes does not exceed 75 students per teacher. First year students in agriculture courses will be counted as .5 for the purpose of determining the total count only.**

Based on this year's R-2 numbers, our FFA member to ag teacher ratio is 74.5 students per teacher. With the addition of another teacher this ratio should be lower next year.

# Quality Criteria Eleven

**11A. A full-time equivalent teacher is employed year-round for each 75 students in the agriculture program and is compensated no less than $2000.**

All ag teachers at Central Valley have full time 228 day contract. They are paid an additional $8,937 in extended contract and FFA stipend pay. Based on this year's R-2, there are no more than 75 students per teacher.

**11B. During the school year, one teaching period for Supervision is assigned to each agriculture teacher. This project supervision period is in addition to the preparation period normally assigned to all teachers in the school. This requirement may also be met if a period is not available by financially compensating the agriculture teacher(s) at the equivalent cost of providing one period of supervision.**

No teachers at Central Valley have a project supervision period currently. Based on a recent meeting with our district superintendent of CTE, we will most likely be funded for one project supervision period next year. Based on my research, this is the first supervision period ever offered in Central Valley High School's existence. Due to the growth of the agriculture program and the efforts of our ag teachers to build solid pathways, the district now recognizes the need for project supervision time.

# Quality Criteria Twelve

**12A. The Agriculture Program meets the requirements of Program Achievement (attach checklist)**

Central Valley Agriculture Does not meet all the requirements for Quality Criteria 12. We are nearly there, but lack in some key areas.

Some of our successful areas are teacher professional development and UC class approval. However, for as large of a chapter as we have, student participation and retention are low. That is the current focus for our department as a way to improve the quality of our chapter. We feel that based on the enrollment of our chapter, state degree qualification is currently too lofty a goal. We do however see an immediate possibility of improving our numbers with program completers and program retention. We also see the potential in increasing state degree numbers as a by-product of more students staying in our program.

Plans we have to improve those areas include a graduate follow-up survey to be administered in May to all seniors before they graduate and 4 year plans to be filled out in December or January before balloting of classes so students know what courses they should take. We are also improving the quality and frequency of meetings for our advisory committee. Finally, we are focusing on getting more students involved in FFA activities at the sectional level through contests like Cooperative Marketing and Best Informed Greenhand.

## ANNUAL FFA CHAPTER ACTIVITIES CHECK SHEET

**Year** 14-15 **School** Central Valley High School

Must meet at least 12 areas

| ACTIVITY | | NUMBER OF PARTICIPANTS |
|---|---|---|
| **Attended the following:** | | |
| Greenhand Conference | | 15 |
| Made For Excellence Conference | | |
| Advanced Leadership Academy | | 6 |
| Chapter Officer Leadership Conference | | 6 |
| Spring Region Meeting | | 3 |
| State Leadership Conference | | 14 |
| National Convention | | |
| **Submitted the following:** | | |
| State Degree Application | | 3 |
| American Degree Application | | 1 |
| Proficiency Award Application - Section | | |
| Chapter Award Application - State | | 20 |
| Scholarship Application - State | | 1 |
| **Participated in the following:** | | |
| Opening and Closing Contest - Section | | 30 |
| Best Informed Greenhand Contest - Section | | |
| Co-Op Marketing Quiz - Section | | |
| Creed Recitation - Section | | |
| Extemporaneous Speaking - Section | | |
| Job Interview - Section | | 3 |
| Impromptu Speaking - Section | | |
| Prepared Speaking - Section | | |
| Parliamentary Procedure - Section | | 6 |
| County/District Fair/Show | | 45 |
| Career Development Teams (other than those identified above) | | |
| 1 | poultry team | 4 |
| 2 | FBM | 5 |
| 3 | Horse judging | 4 |
| Other Activity Above the Chapter Level (Leadership Events/Additional CDE Teams) | | |
| 1 | floriculture | 4 |
| 2 | dairy cattle | 5 |
| 3 | | |
| 4 | | |
| 5 | | |
| **TOTAL AREAS MET** | | 18 |

# CALIFORNIA DEPARTMENT OF EDUCATION
# AGRICULTURAL VOCATIONAL EDUCATION INCENTIVE GRANT

## QUALITY CRITERIA 12

| | |
|---|---|
| 410 | Number of Students on Last Year's R-2 Form |

**12A. Curriculum and Instruction**

| | |
|---|---|
| 7 | Number of UC Approved Agriculture Courses (must be at least one) |

**12B. Leadership and Citizenship Development**

| | |
|---|---|
| 18 | Number of activities on the approved FFA activity list which the local chapter participated in (must participate in at least 80% of the activities). |

**12C Practical Application of Occupational Skills**

| | |
|---|---|
| 5 | Number of students who received the State FFA Degree (must be at least 5% of the R-2 number) |

**12D Qualified and Professional Activities**

| | |
|---|---|
| 5 | Number of teachers who attended a minimum of 5 professional inservice activities (must attach approved Inservice Activities Verification Page) |

**12E Community, Business and Industry Involvement**

| | |
|---|---|
| 2 | Number of meetings held by the local Agriculture Advisory Committee (must meet at least 3 times with minutes attached) |

Name of Agriculture Advisory Committee Chair: Dave Brown

Phone Number of Ag. Advisory Committee Chair:

**12F Retention**

| | |
|---|---|
| 48 | Number of students who were in their 3rd and 4th year of agriculture instruction (must be at least 25% of the R-2 number) |

**12G Graduate Follow-Up**

| | |
|---|---|
| 18 | Number of program completers graduating last year. |
| 11 | Number of those who graduated who are employed in agriculture, in the military, or continuing their education (must be at least 75% of the program completers) Attach graduate follow-up |

# Appendix:
# Support Documents

**Appendix A: Student Data Sheet**

## Central Valley Agriculture Department- Student Data Career Plan

Name: ______________________________________ Gender (Highlight One): Male Female
(First) (Middle) (Last)

Age:__________________ Grade Level in School: (Highlight one) 9 10 11 12

Year in Agriculture Program: (Highlight one) 1 2 3 4

Program of Instruction Being Pursued: (select only one)
- ___ Plant and Soil Science
- ___ Agriculture Science
- ___Animal Science/ Vet Science
- ___Ag Mechanics/Power Mechanics
- ___Ornamental Horticulture/Floriculture

When you eventually graduate high school and take your place in the world, what would you like to do? If your career choice is not related to agriculture, write in parenthesis () a career in agriculture you would be interested in:

______________________________________________________________________________

Please indicated your plans after high school:
- ____Go to work full time
  - ____No further education
  - ____Some college later

- ____Go to college
  - ____Community College
  - ____Four Year college

  - ____Full time student
  - ____Part time student

  - ____Agriculture Major
  - ____Non-Agriculture major
  - ____Go into Military Service

## Student Program Planning Form

Planned course of study to meet occupational goal. By school year, list all classes previously taken, currently being taken, and planned to be taken in the future.

<u>Graduation Requirements:</u>
*History* (3 years) [1 year world history, 1 year US history, 1 year government/economics]
*English* (4 years)
*Science* (3 years) [1 year life science, 1 year physical science, 1 year science - your choice]
*Math* (2 years) (at least Algebra 1 & Geometry or Math I & Math II)
*PE* (2 years)
*Fine Arts or Foreign Language* (1 year)
*Electives* 9 elective classes (everything above the min grad requirement is considered an elective, ex. 3rd year of math, 4th year of science, etc)

| FRESHMAN YEAR (20__ - __) | SOPHOMORE YEAR (20__ - __) | JUNIOR YEAR (20__ - __) | SENIOR YEAR (20__ - __) |
|---|---|---|---|
| CLASS | CLASS | CLASS | CLASS |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**Appendix B: Permanent Student File**

Our department does not have a unified permanent file system. Part of this is lack of space, another part is due to the distance between our classrooms. The ag department is not situated on a central location. Below are photos of my record book and personal information storage. In the fall, all our continuing students retrieve their record books from their previous teacher. I keep my students' books for one year after they graduate for American Degree purposes. Our department is transitioning over to a paperless system through google drive and using irecordbooks (and AET when implemented) so much of this storage will disappear in years to come.


**Appendix C: Agriculture Course Outline**

Below are the course outlines included in the Central Valley High School Course Handbook. Additions for next year are incorporating all 3 UCCI agriscience courses, food science, and a change in intro to animal ag to intro to plant and animal ag.

**<u>Ag Biology</u> CSU/UC (d) GRAD CREDIT: Life Science 9th –12th grade**
This college pre course follows a fundamental approach to biology as it relates to agri-science. Topics of study include organisms and their environments, plant science and animal science. Laboratory experiments will reinforce classroom concepts. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**<u>Advanced Ag Biology</u> CSU/UC (d) GRAD CREDIT: Life Science 9th –12th grade**
This accelerated rigorous course is designed for Honors/Gate agriculture students who are college-bound. This course involves in-depth study of cellular organization and processes, reproduction of plants and animals, genetics, evolution, physiology of agriculture plant and animals and ecology. Emphasis will be placed on investigation, analysis, and critical thinking of course contents through labs and agriculture research projects. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**<u>Ag Chemistry</u> CSU/UC (d) GRAD CREDIT: Physical Science 10th -12th grade**
This is a college preparatory course for students interested in pursuing agricultural science programs in college, with emphasis on chemistry's applications to the environment and agricultural practices. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Students will also develop and present a content-relevant research project. <u>**Prereqisite:** Successful completion of Ag Biology or instructor approval.</u>

**<u>Veterinary Science</u> CSU/UC (g) GRAD CREDIT: Elective 11th –12th grade**
This course provides a basic overview of the veterinary field covering career skills, career opportunities, sanitation, various species of small animals, anatomy and physiology, nutrition, disease control, lab skills, pharmacology, emergency procedures, radiology, and common surgery procedures. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. <u>**Prerequisite:** Completion of Animal Science or instructor approval</u>.

**Animal Science** **CSU/UC (g)** **GRAD CREDIT: Elective** **10th –12th grade**
This advanced course in Animal Science will focus on livestock management practices. Included in this course will be livestock breeds, health care, handling facilities, anatomy and physiology, artificial insemination and breeding practices, judging and many other hands-on activities. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. **Prerequisite:** Completion of Intro to Animal Agriculture or instructor approval.

**Intro To Animal Agriculture CSU/UC (g)** **GRAD CREDIT: Elective** **9th -12th grade**
This course provides a survey of the livestock industry, including the supply of animal products and their uses. A special emphasis is placed on the origin, characteristics, adaptation and contributions of farm animals to the agriculture industry. Students have the ability to have hands on experience with livestock animals within this course. There will be a main focus on animal industry history, external anatomy, breeds, feeding, showing and general care and veterinary practices. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**Intro To Power Mechanics** **GRAD CREDIT: Elective** **10th –12th grade**
This introductory course will focus on small engines. The subjects that will be covered are internal combustion, electrical systems, fuel and fuel systems, hydraulics, maintenance and repair. The class will emphasize hands- on experience. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**Intro To Ag Mechanics** **GRAD CREDIT: Elective** **9th –12th grade**
This course is designed to provide students with basic skills and knowledge in the areas of shop safety, rope work, cold metal, plumbing, electrical, wood working, and welding. Students will receive classroom instruction as well as "hands on" experience. Each unit of instruction includes a required project that is designed to allow the student to apply those skills learned in the classroom to a practical application and will be shown at the Stanislaus County Fair. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**ROP Power Mechanics** **GRAD CREDIT: Elective** **11th –12th grade**
This is a project-based course where students will learn the fundamentals of operations and engine diagnostics. Students will perform engine assembly and disassembly. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. **Prerequisite:** Successful Completion of Intro to Power Mechanics, or instructor approval.

**Introduction To Plant Production** **GRAD CREDIT: Elective** **10th –12th grade**
This class will focus on how to grow and care for house plants and plants used for landscaping. Students will learn how to reproduce plants, provide fertilizer, pest control, marketing and operate a greenhouse through hands-on experience. If you like plants, this is the class for you. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**ROP Plant Production** **GRAD CREDIT: Elective** **11th –12th grade**
This two-period course deals with landscape design, installation and maintenance. Topics of study include: landscape design, study of color, location of lawns, trees, shrubs, walks, driveways, patios, planters, and other landscape structures for home and parks. A great deal of the class consists of hands-on-activities. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**Ag Welding** **GRAD CREDIT: Elective** **10th –12th grade**
Students will learn how to arc weld, oxy-acetylene weld, cut, braze, and MIG (wire feed) weld. Students will get experience in basic project construction. All completed projects will be shown at the Stanislaus County Fair in Turlock. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.
**Prerequisite:** Successful Completion of Intro to Ag Mechanics, or Instructor Approval.

**ROP Welding** **GRAD CREDIT: Elective** **11th –12th grade**
This two period course is for the development of advanced welding skills. Students learn advanced skills in arc welding, MIG (wire feed), oxyacetylene welding and cutting, plasma cutting, and TIG (Tungsten and Inert Gas welding). Students will further develop job-related skills by becoming self-starters and acquiring necessary materials for projects, while developing safety and fire prevention attitudes. Students will earn college credits at Modesto Junior College if they complete the class and enroll at MJC. They will be prepared for a job in a welding shop. All completed projects will be shown at the Stanislaus County Fair. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**<u>ROP Welding Fabrication II</u>** **GRAD CREDIT: Elective** **12th grade**
This two period course, Welding & Fabrication provides serious students with entry-level skills at the completion of the course. Instruction is provided in advanced Shielded Metal and Gas Metal Arc Welding (M.I.G.) and advanced Oxy-Acetylene Welding. Gas Tungsten Arc Welding (T.I.G.) is also covered. Students are required to develop skills in welding overhead and completing welding certification tests, along with refining skills in operating the Air Carbon Arc, Plasma Arc, and Oxy-Acetylene cutting units. Students receive instruction in safety, hand and power tool usage, planning, and material selection and usage as related to the construction of items used around the shop and home. Students experiment with their own ideas and methods in the design and fabrication of an individual project. Students are allowed one semester to complete this task. If taken a second year, students are able to work on more complex projects that are more intense in design and fabrication. Students are encouraged to exhibit their projects at the local county fair and the California State Fair. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.
**<u>Prerequisite</u>**<u>: Course: ROP Ag Welding.</u>

**<u>ROP Intro To Floriculture</u>** **GRAD CREDIT: Elective** **9th-12th grade**
This course is designed for students who are interested in the art of floral design. This course will cover flower care and processing, tool identification, flower ID, basic flower arranging, corsage construction, balloon design, and house plant care. The class will do seasonal projects with fresh flowers and dry materials. This class will prepare students for Ag Floriculture (ROP). Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**<u>ROP Ag Adv Floriculture</u>** **CSU/UC (f) GRAD CREDIT: Fine Art or Elective 11th –12th**
The Advanced Ag Floriculture ROP course will give students career experience in floral design and the artistic principles of visual art. Students will create floral arrangements using advanced design principles. Part of the class will be designing and arranging for outside floral sales such as weddings and events. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

**<u>Ag Leadership</u>** **GRAD CREDIT: Elective** **9th-12th grade**
This course is designed to promote and develop leadership in the Agriculture Industry. Topics will include current issues in Ag, Ag legislation, development of personal leadership skills, FFA operation and Judging Teams and exploration of past and present needs in the Ag Industry and its leaders. This course will be offered during 0 period. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

## Appendix D: Course Gradebooks

Our school uses infinite campus to keep track of student grades. All grades are entered into this program only because it is visible to students, parents, administrators, counselors, and teachers in real time. I also grade on a 4 point scale with modified grades. A 4 is equivalent to 85-100%, 3 is equivalent to 70-85%, 2 is equivalent to 50-70%, 1 is equivalent to 35-50%, and less than 35% on any assignment is a 0.

These are 1st period Introduction to Animal Agriculture grades from 1st semester. FFA and SAE are 10% of their grade and are entered into grades at the end of the semester.

**Term S1 HS Report Card Scores**

| Student | 1 syll | 2 emble | 3 Book | 4 poste | 5 sub1 | 6 vocab | 7 BelAd | 8 FFAT | 9 C#1 | 10 C#2 | 11 intro | 12 CO3 | 13 CO4 | 14 CO#5 | 15 beef | Percent | In-Progress Grade |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Points Possible** | **1** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | | |
| 75921 | 1 | 4 | 4 | 4 | 4 | 3*L | 3 | 4 | 3 | 3 | 3 | 0 | 2 | 2 | 3 | 78.88 | B |
| 78296 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 2 | 93.05 | A |
| 75903 | 1 | 4 | 4 | 4 | 0 | 4 | 3.5 | 3 | 3 | 2 | 1.5 | 0 | 3 | 2 | 3 | 69.86 | C |
| 80493 | | | 2 | 3 | 0 | 0*M | 3 | 2 | 2 | 1 | 1 | 4 | 1 | 3 | 1 | 43.05 | F |
| 78502 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 2.5 | 3 | 4 | 4 | 2 | 95.13 | A |
| 74487 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 100.00 | A+ |
| 1011495 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 100.00 | A+ |
| 1002164 | 1 | 4 | 4 | 4 | 4 | 4 | 3.5 | 5 | 4 | 3 | 3 | 4 | 4 | 3 | 3 | 94.72 | A |
| 1001989 | 1 | 4 | 4 | 4 | 4 | 4 | | 4 | 3 | 4 | 3.5 | 4 | 4 | 3 | 3 | 95.13 | A |
| 75727 | 1 | 4 | 4 | 3 | 0 | 3*L | 3 | 4 | 4 | 3 | 3 | *M | 2 | 2 | 1 | 66.38 | C |
| 75729 | 1 | 4 | 4 | 3 | 0 | 4 | 3 | 2 | 4 | 2 | 3 | 0 | 4 | 3 | 1 | 68.61 | C |
| 1019260 | 1 | 4 | 4 | 4 | 0 | 0*M | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 79.44 | B |
| 78348 | 1 | 4 | 4 | 3*L | 4 | 2*L | 4 | 4 | 3 | 0 | 3 | 2 | 4 | 3 | 2 | 78.05 | B |
| 1023671 | | | | | | | | | | | | | | 0 | *M | 0.00 | F |
| 1005413 | 1 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 3 | 93.61 | A |
| 78781 | 1 | 4 | 4 | 4 | 0 | 2*L | 4 | 4 | 4 | 4 | 3.5 | 3 | 4 | 4 | 3 | 83.19 | B |
| 74724 | 1 | 4 | 3 | 3*L | 0 | 0*M | 3 | 2 | 1 | 0 | 3 | 3 | 0 | 4 | 1 | 50.55 | D |
| 1022707 | 1 | 0 | 3 | 4 | 0 | 4 | | 2 | 3 | 1 | 0 | 0 | 2 | 1 | *M | 44.24 | F |
| 1015617 | 0 | | 4 | 4 | 4 | 4 | | 3 | 4 | 2 | 3 | 2 | 4 | 4 | 2 | 85.62 | A |
| 1021907 | 1 | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 10 | 4 | 1.5 | 2 | 0 | 3 | 1 | 86.52 | A |
| 1000977 | 1 | 4 | 4 | 4 | 0 | 4 | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 2 | 85.55 | A |
| 1022730 | 1 | 4 | 4 | 2 | 0 | 0*M | 4 | 4 | 4 | 4 | 4 | 1 | 4 | 2 | 3 | 69.44 | C |
| 1017060 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 2 | 2 | 1 | 4 | 4 | 3 | 90.27 | A |
| 75884 | 1 | 0 | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 3 | 2.5 | 1 | 0 | 2 | 2 | 67.91 | C |
| 1022079 | 1 | 4 | 4 | 4 | 4 | 2*L | 3 | 5 | 4 | 3 | 2.5 | 2 | *M | 2 | 2 | 77.36 | B |
| 1019243 | 1 | 4 | 0*M | 4 | 0 | 2*L | 4 | *M | 1 | 3 | 4 | 3 | 4 | 4 | 1 | 61.11 | C |
| 1007003 | 1 | 4 | 3 | 4 | 4 | 0*M | 4 | 3 | 4 | 3 | 0*Ch | 4 | 3 | 4 | *M | 73.61 | B |
| 1015582 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 3.5 | 4 | 4 | 4 | 4 | 100.69 | A+ |
| 81584 | 1 | 4 | 3 | 4 | | 4 | 3 | 2 | 0 | 0 | 1.5 | 0 | 0 | 1 | 1 | 57.90 | D |
| 1016093 | 1 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 2 | 4 | 4 | 2 | 4 | 1 | 88.05 | A |
| 1003008 | 1 | 4 | 3 | 4 | 0 | 4 | | 1 | 3 | 0 | 3 | 0 | 0 | 2 | 2 | 57.60 | D |
| 71104 | 1 | 4 | 4 | 4 | 4 | 4 | | 2 | 4 | 3 | 2.5 | 2 | 0 | 1 | 2 | 78.47 | B |
| 1015984 | 1 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 2 | 3 | 2.5 | 2 | 0 | 3 | 1 | 76.25 | B |
| 78287 | 1 | 4 | 5 | 3 | 0 | 2 | 4 | 2 | 3 | 4 | 2 | 4 | 0 | 2 | 2 | 68.61 | C |
| **Assignment Averages** | **1** | **3.7** | **3.7** | **3.7** | **2.4** | **3** | **3.6** | **3.5** | **3.5** | **2.7** | **2.7** | **2.4** | **2.6** | **2.9** | **2.2** | **75.26** | |

| Term S1 HS Report Card Scores | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Student | 1 syll | 2 emble | 3 Book | 4 poste | 5 sub1 | 6 vocab | 7 BelAd | 8 FFAT | 9 C#1 | 10 C#2 | 11 intro | 12 CO3 | 13 CO4 | 14 CO#5 | 15 beef | Percent | In-Progress Grade |
| **Points Possible** | **1** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | | |
| 75935 | 1 | 4 | 4 | 4 | 4 | 4 | | 5 | 4 | 4 | 2.5 | 2 | *M | *M | 2 | 82.63 | B |
| 83117 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 3.5 | 1 | 2 | *M | 2 | 85.41 | A |
| 1006957 | 1 | 0 | 2 | 0*M | 1 | | 3 | 2 | 4 | 3 | 1 | 0 | 0 | *M | 1 | 33.79 | F |
| 1015753 | 1 | 0 | 5 | 4 | 4 | 0*M | | 4 | 4 | 4 | 2.5 | 3 | 2 | 2 | 2 | 69.67 | C |
| 1016013 | 1 | 4 | 4 | 3 | 4 | 4 | 3*L | 5 | 4 | 3 | 3.5 | 1 | 4 | 4 | 3 | 89.30 | A |
| 1020623 | 1 | 4 | 5 | 4 | 4 | 4 | 3 | 4 | 4 | 3 | 2.5 | 2 | 4 | 4 | 3 | 92.36 | A |
| 1019813 | 1 | 3*L | 4 | 4 | 4 | 0*M | 3*L | 3 | *M | 3*L | 1.5 | *M | 2 | 2 | 3 | 62.36 | C |
| 1021408 | 0 | 4 | 4 | 4 | 4 | 0*M | | 4 | 4 | 3 | 3 | 0 | 4 | 2 | 2 | 72.88 | B |
| 78899 | 1 | 4 | 4 | 0*M | 4 | 4 | 3 | 4 | 4 | 2 | 2.5 | 0 | 4 | 2 | 3 | 74.30 | B |
| 75453 | | | | | | | | | | | | | | *M | *X | 0.00 | F |
| 76072 | 1 | 4 | 6 | 4 | 4 | 4 | | 5 | 4 | 4 | 2.5 | 2 | 4 | 4 | 3 | 100.42 | A+ |
| 1023751 | | | | | | | | | | | | | | | *X | | |
| 1020164 | 1 | 3*L | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 2 | 2.5 | 4 | 4 | 4 | 2 | 87.91 | A |
| 1021748 | 1 | 0 | 6 | 4 | 4 | 2*L | | 4 | 4 | 3 | 2.5 | 3 | 2 | 2 | 2 | 76.22 | B |
| 1008156 | 0 | 0 | 0 | 3*L | 4 | 3*L | | 2 | 3 | 3 | 3 | 0 | 4 | 0 | 1 | 48.67 | F |
| 1016723 | 1 | 4 | 4 | 0*M | 0 | 3 | 4 | 3 | 4 | 4 | 2.5 | 3 | 3 | 0 | 1 | 64.02 | C |
| 1009048 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 3.5 | 4 | 4 | 4 | 3 | 99.30 | A |
| 75051 | | | 4 | 4 | 0 | 4 | 4 | 3 | 4 | 4 | 4 | 1 | 2 | 4 | 3 | 79.16 | B |
| 71697 | 1 | 3*L | 5 | 4 | 3 | 4 | | 3 | 3 | 0 | 2.5 | 0 | 2 | 2 | 2 | 73.04 | B |
| 1005408 | 1 | 3*L | 4 | 3*L | 2 | 4 | | 4 | 4 | 4 | 2.5 | 4 | 4 | 4 | 2 | 84.55 | B |
| 76101 | 1 | 2 | 4 | 3 | 4 | 2*L | | 4 | 4 | 4 | 2.5 | 2 | 4 | 3 | 2 | 77.74 | B |
| 81850 | 1 | 4 | 4 | 3*L | 4 | 4 | | 4 | 4 | 4 | 1 | 1 | 2 | 3 | 2 | 82.07 | B |
| 1013737 | 1 | 4 | 4 | 4 | 0 | 4 | 3 | 3 | 4 | 4 | 2.5 | 0 | 2 | 3 | 2 | 72.91 | B |
| 1018789 | 1 | 0 | 3 | 2 | 4 | 3 | | 1 | 4 | 3 | 3.5 | 0 | 1 | 0 | 3 | 55.91 | D |
| 74146 | 1 | 4 | 4 | 4 | 3 | 4 | 4 | 5 | 4 | 4 | 3.5 | 4 | 4 | 4 | 4 | 98.47 | A |
| 74844 | 1 | 0 | 4 | 0*M | 4 | 0*M | 2 | 3 | 4 | 3 | 2 | 3 | *M | 2 | 2 | 50.83 | D |
| 1020458 | 1 | 4 | 4 | 4 | 4 | 2*L | 3 | 4 | 4 | 2 | 2 | 2 | 1 | 0 | 1 | 71.11 | B |
| 1010038 | 1 | 4 | 4 | 4 | 4 | 4 | | 2 | 2 | 3 | 2.5 | 0 | 2 | 2 | 2 | 77.08 | B |
| 81363 | 1 | 4 | 4 | 4 | 4 | 4 | | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 101.38 | A+ |
| 81081 | 1 | 4 | 4 | 4 | 4 | | | 4 | 4 | 0 | 2.5 | 1 | 0 | 1 | 1 | 74.30 | B |
| 83772 | 1 | 4 | 4 | 4 | | 4 | | 5 | 4 | 4 | 3 | 3 | 4 | 2 | 2 | 93.05 | A |
| 1015746 | 1 | 0 | 0 | 0*M | 0 | 0*M | | 2 | 4 | 0 | 3 | 0 | 1 | 0 | 2 | 19.31 | F |
| 79012 | 1 | 4 | 4 | 4 | 4 | 4 | | 4 | 4 | 4 | 1 | 0 | 4 | 2 | 2 | 84.72 | B |
| 72997 | 1 | 4 | 4 | 4 | 0 | 4 | 2 | 3 | 4 | 3 | 1 | 0 | 4 | 2 | 1 | 67.22 | C |
| **Assignment Averages** | **0.9** | **2.9** | **3.9** | **3.2** | **3.1** | **3** | **3.2** | **3.7** | **3.9** | **3.1** | **2.6** | **1.6** | **2.8** | **2.3** | **2.2** | **72.79** | |

These are 2nd period Introduction to Animal Agriculture grades from 1st semester. FFA and SAE are 10% of their grade and are entered into grades at the end of the semester.

| Term S1 HS Report Card Scores | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Student | 1 pseud | 2 syll | 3 Scime | 4 soilw | 5 propo | 6 Sub1 | 7 Ref | 8 sub2 | 9 EDM | 10 intro | 11 SoilT | 12 molEC | 13 Atom | 14 STlab | 15 Soil | Percent | In-Progress Grade |
| **Points Possible** | **4** | **1** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **0** | **4** | **4** | **4** | | |
| 78867 | | | | | 3 | | 1*L | 4 | 0*M | 0*M | 4 | | 4 | 2 | 3 | 61.11 | C |
| 1014859 | 4 | 1 | 4 | 3 | 1 | 2 | 3*L | 3*L | 2*L | 1 | 4 | | 4 | 3 | 2 | 71.27 | B |
| 87037 | 4 | 1 | 3 | 3 | 4 | 2 | 3 | 4 | 2 | 1 | 4 | 12 | 3 | 2 | 2 | 84.19 | B |
| 1011951 | | | | | | | | | | | | | | | | | |
| 69296 | 4 | 1 | 2 | 3 | 4 | 4 | 3*L | 4 | 2*L | 1 | 4 | | 3 | 1 | 1 | 61.87 | C |
| 79992 | 3 | 1 | 3 | 3 | 1 | 4 | | 4 | | 0*M | *M | | 1 | 2 | 2 | 50.50 | D |
| 68803 | 4 | 1 | 2 | 3 | 0*M | 1 | 0*M | 2 | 0*M | 0*M | 4 | | 2 | *M | 2 | 37.85 | F |
| 78364 | 4 | 1 | 0 | 2 | 3*L | 4 | 1*L | 4 | 0*M | 0*M | 4 | | 3 | 2 | 3 | 60.79 | C |
| 72910 | 4 | 1 | 2 | 3*L | 4 | 3 | 1 | 2 | 2*L | 0*M | 4 | | 1 | 3 | 3 | 61.15 | C |
| 1006199 | 4 | 1 | 4 | 3 | 4 | 2 | 4 | 4 | 2*L | 1 | 4 | | 3 | 2 | 4 | 78.04 | B |
| 1011772 | 3 | 1 | 3 | 2 | 3*L | 2 | 0*M | | 1*L | 0*M | 4 | | 2 | *M | 3 | 47.04 | F |
| 72981 | 3 | 1 | 2 | 0 | 3 | 2 | 2*L | 4 | 2*L | 0*M | 4 | | 3 | 1 | 1 | 49.68 | F |
| 1009935 | 3 | 1 | 4 | 2 | 4 | 4 | 1 | 4 | 1*L | 0*M | 4 | | 1 | 1 | 1 | 49.05 | F |
| 1003240 | 4 | 1 | 4 | 3 | 4 | 3 | *M | | 1*L | 0*M | 4 | 4 | 4 | 2 | 3 | 75.37 | B |
| 74493 | 4 | 1 | 4 | 2 | 4 | 4 | 4 | 4 | 3 | 1 | 4 | | 4 | 4 | 4 | 91.86 | A |
| 86984 | 3 | 1 | 4 | 4 | 4 | 2 | 4 | 3 | 2*L | 1 | 4 | | *M | 2 | 2 | 58.17 | D |
| 1019644 | 4 | 1 | 4 | 3 | 4 | 2 | 3*L | 4 | 2*L | 1 | 4 | | 2 | 4 | 4 | 80.39 | B |
| 85398 | 4 | 1 | 4 | 4 | 4 | 2 | 1*L | 4 | 2*L | 1 | 4 | 6 | 3 | 2 | 2 | 76.06 | B |
| 74719 | 4 | 1 | 4 | 3 | 4 | 4 | 1 | 4 | 1*L | 0*M | 4 | | 3 | *M | *M | 51.76 | D |
| 1019758 | 4 | 1 | 0 | 2 | 1 | 3 | 0*M | | 1*L | 0*M | *M | | 1 | *M | 2 | 29.12 | F |
| 77737 | 4 | 1 | 3 | 0 | 4 | 2 | 1*L | 4 | 1*L | 1 | 4 | | *M | *M | *M | 33.87 | F |
| 70875 | 4 | 1 | 3 | 3*L | 4 | 2 | 1 | 2 | 2*L | 0*M | 4 | | 2 | *M | 0 | 42.63 | F |
| 74397 | 4 | 1 | 3 | 2 | 4 | 2 | 1*L | 4 | 1*L | 1 | 4 | 12 | 3 | 3 | 1 | 78.77 | B |
| 83748 | 4 | 1 | 4 | 3 | 4 | 3 | 1 | 4 | 0*M | 0*M | 4 | | 4 | 3 | 3 | 74.97 | B |
| 80733 | 4 | 1 | 4 | 3 | 1*L | 3 | 0*M | 3 | 3 | 0*M | *M | 6 | 4 | *M | 1 | 56.45 | D |
| 78314 | 3 | 1 | 4 | 3 | 4 | 2 | 3*L | 4 | 2 | 1 | 4 | | 2 | | 1 | 58.67 | D |
| 74237 | 4 | 1 | 3 | 3 | 3*L | 3 | 1 | 2 | 2*L | 1 | 4 | | 4 | 1 | 2 | 62.51 | C |
| **Assignment Averages** | **3.8** | **1** | **3.1** | **2.6** | **3.2** | **2.7** | **1.7** | **3.5** | **1.5** | **0.5** | **4** | **8** | **2.8** | **2.2** | **2.2** | **60.89** | |

These are 4th period Introduction to Ag Chemistry grades from 1st semester. FFA and SAE are 10% of their grade and are entered into grades at the end of the semester.

| Term S1 HS Report Card Scores | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Student | 1 pseud | 2 syll | 3 Scime | 4 soilw | 5 propo | 6 Sub1 | 7 Ref | 8 sub2 | 9 EDM | 10 perta | 11 intro | 12 SoilT | 13 molEC | 14 Atom | 15 STlab | 16 Soil | Percent | In-Progress Grade |
| **Points Possible** | **4** | **1** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **0** | **4** | **4** | **4** | | |
| 75636 | 2 | 1 | 3 | 3 | 4 | 2 | 2*L | 4 | 1*L | 4 | 0*M | 4 | | 4 | | 3 | 75.92 | B |
| 74236 | 0 | 1 | 4 | 3*L | 3 | 2 | 3*L | 4 | 3*L | 4 | 0*M | 4 | 10 | 4 | | 3 | 89.50 | A |
| 1017608 | 4 | 1 | 3 | 3 | 4 | 0 | 3 | 4 | 1 | 4 | 1 | *M | 9 | 1 | | 2 | 62.34 | C |
| 1010317 | 4 | 1 | 4 | 4 | 1 | 0 | 3*L | 4 | 0*M | 3 | 0*M | *M | | 4 | | *M | 51.85 | D |
| 72969 | 4 | 1 | 3 | 2 | 4 | 3 | 3 | 4 | 1 | 4 | 1 | 4 | 12 | 3 | | 2 | 84.56 | B |
| 74420 | 4 | 1 | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | .5 | 4 | | 4 | | 3 | 87.65 | A |
| 75369 | 4 | 1 | 4 | 3 | 0 | 0 | 2*L | 3 | 1*L | 4 | 0*M | 4 | | 4 | | 3 | 70.98 | B |
| 78208 | 4 | 1 | 3 | 0 | 1 | 2 | 0*M | 2 | 0*M | 4 | 0*M | 4 | | 2 | | 3 | 53.70 | D |
| 68136 | 4 | 1 | 3 | 2 | 4 | 3 | 0*M | 2 | 0*M | 4 | 0*M | 4 | | 0 | | 0 | 33.33 | F |
| 75706 | 4 | 1 | 0 | 2 | 0 | 0 | 0*M | 3 | 0*M | 0 | 0*M | 3 | | 2 | | 2 | 38.27 | F |
| 74679 | 4 | 1 | 3 | 3 | 4 | 4 | 3 | 4 | 2 | 4 | 1 | 4 | 12 | 4 | | 2 | 93.82 | A |
| 71032 | 4 | 1 | 2 | 3 | 4 | 4 | 4 | 4 | 3*L | 4 | 0*M | 4 | 4 | 2 | | 3 | 78.39 | B |
| 68128 | 4 | 1 | 0 | 0 | 1 | 2 | 3*L | 3 | 0*M | 4 | 0*M | 4 | | 3*L | | 0 | 43.82 | F |
| 74901 | 3 | 1 | 2 | 3 | 4 | 2 | 4 | 4 | 2 | 4 | 1 | 4 | | 4 | | 3 | 80.86 | B |
| 1012813 | 2 | 1 | 4 | 0 | 4 | 0 | 0*M | 0 | | 3 | 0*M | 4 | | 1 | | *M | 29.94 | F |
| 79219 | 3 | 1 | 2 | 3 | 0 | 3 | 1*L | 4 | 1 | 4 | 1 | 4 | | 1 | | 2 | 50.00 | D |
| 72005 | 4 | 1 | 4 | 0 | 4 | 3 | 3 | 3 | 1 | 4 | 0*M | *M | | 1 | | 0 | 38.88 | F |
| 78712 | 4 | 1 | 2 | 3 | 4 | 3 | 2*L | 4 | 1 | 0 | 1 | 4 | | 3 | | 2 | 63.58 | C |
| 76970 | 4 | 1 | 3 | 3 | 4 | 3 | 2 | 4 | 3 | 4 | 1 | 4 | 8 | 1 | | 2 | 70.98 | B |
| 74888 | 4 | 1 | 3 | 3 | 3*L | 4 | 0*M | 4 | 2 | 4 | 1 | 4 | 8 | 3 | | 3 | 83.95 | B |
| 1021117 | 4 | 1 | 2 | 4 | 4 | 3 | 4 | 3 | 4 | 4 | 1 | 4 | 10 | 3 | | 3 | 92.59 | A |
| 72946 | 4 | 1 | 3 | 3 | 4 | 3 | 4 | 4 | 2 | 4 | 1 | 4 | 8 | 1 | | 2 | 72.22 | B |
| 74427 | 4 | 1 | 3 | 3 | 4 | 4 | 3*L | 4 | 0*M | 4 | 0*M | *M | | 4 | | 3 | 75.92 | B |
| 78682 | 4 | 1 | 4 | 4 | 1*L | 3 | 1*L | 0 | 1*L | 4 | 0*M | 4 | | 2 | | 2 | 55.55 | D |
| 71547 | 3 | 1 | 2 | 3 | 4 | 3 | 1*L | 0 | 2*L | 4 | 0*M | *M | | 1 | | 1 | 39.50 | F |
| 85440 | 4 | 1 | 4 | 4 | 4 | 4 | 2 | 4 | 3 | 4 | 1 | 4 | 10 | 1 | | *M | 66.04 | C |
| 1015892 | 3 | 1 | 3 | 2 | 1 | 2 | 0*M | 4 | 0*M | 4 | 0*M | 4 | | 1 | | 2 | 46.29 | F |
| 1012912 | 3 | 1 | 2 | 2 | 4 | 3 | 2*L | 4 | 1*L | 4 | 0*M | 4 | | 0 | | 0 | 37.03 | F |
| 74685 | 4 | 1 | 2 | 3 | 4 | 4 | 4 | 4 | 1 | 4 | 1 | 4 | | 4 | | 3 | 83.33 | B |
| 71287 | 4 | 1 | 2 | 3 | 4 | 4 | 4 | 3 | 3*L | 4 | 0*M | 4 | | 4 | | 2 | 77.77 | B |
| **Assignment Averages** | **3.6** | **1** | **2.8** | **2.6** | **3** | **2.6** | **2.2** | **3.3** | **1.4** | **3.7** | **0.4** | **4** | **9.1** | **2.4** | | **2.1** | **64.29** | |

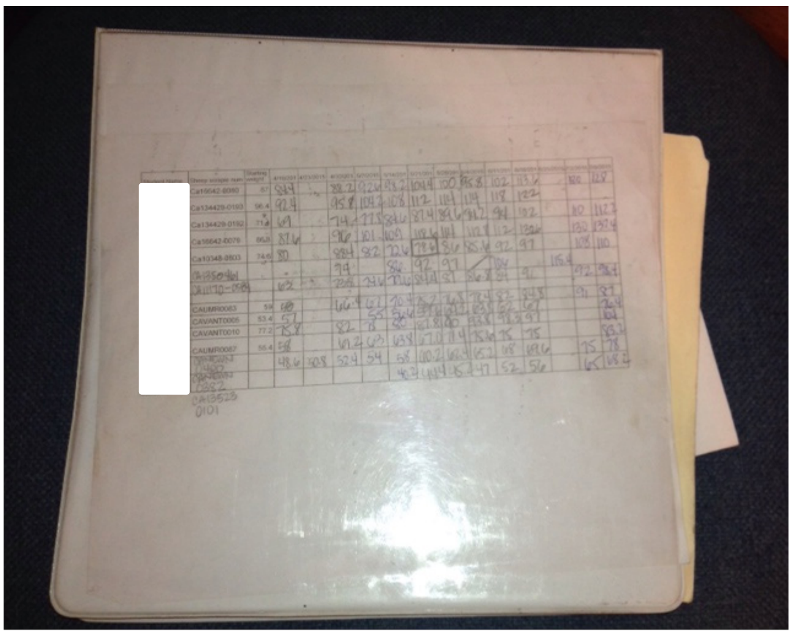
These are 5th period Introduction to Ag Chemistry grades from 1st semester. FFA and SAE are 10% of their grade and are entered into grades at the end of the semester.

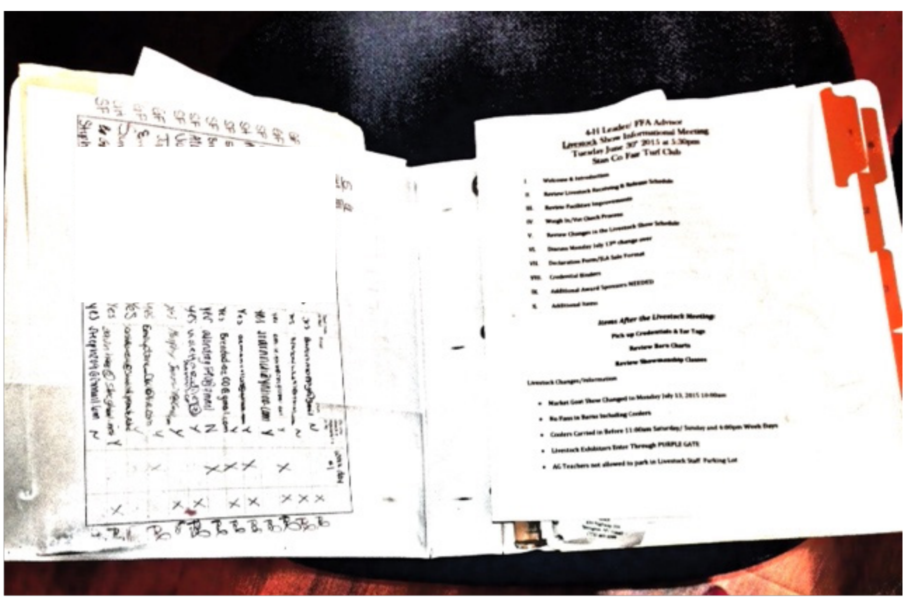
| | pseud | syll | Scime | soilw | propo | Sub1 | Ref | sub2 | EDM | perta | intro | SoilT | molEC | Atom | STlab | Soil | | Grade |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Points Possible** | **4** | **1** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **4** | **0** | **4** | **4** | **4** | | |
| 83782 | 4 | 1 | 4 | 3 | 4 | 0 | 2 | 4 | 4 | 0 | 1 | 4 | | 4 | | 4 | 82.71 | B |
| 74432 | 4 | 1 | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | 1 | 4 | | 4 | | 3 | 88.27 | A |
| 1000624 | 4 | 1 | 3 | 4 | 4 | 0 | 1*L | 4 | 1*L | 0 | 1 | 3 | | 0 | | 0 | 32.09 | F |
| 74494 | 4 | 1 | 4 | 0 | 4 | 2 | 1 | 4 | 4 | 4 | 1 | 4 | | 2 | | 2 | 62.96 | C |
| 1009142 | 4 | 1 | 3 | 3 | 4 | 2 | 3 | 3 | 0*M | 4 | 1 | 3 | 10 | 0 | | 2 | 61.72 | C |
| 69114 | 3 | 1 | 2*L | 3*L | 4 | 1 | 4 | 3 | 4 | 4 | 0*M | 4 | | 1 | | 0 | 46.29 | F |
| 74270 | 4 | 1 | 0 | 3 | 4 | 1 | 1 | 4 | 2*L | 4 | 0*M | *M | 4 | 3 | | 2 | 62.34 | C |
| 72562 | 4 | 1 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 1 | 4 | | 4 | | 4 | 95.06 | A |
| 74395 | 4 | 1 | 3 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 1 | *M | | 4 | | 3 | 82.09 | B |
| 74672 | 4 | 1 | 3 | 0 | 3*L | 1 | 2*L | 4 | 3 | 2 | 1 | 4 | | *M | | 2 | 45.67 | F |
| 74676 | 4 | 1 | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | 1 | 4 | 4 | 4 | | 4 | 98.76 | A |
| 78773 | 4 | 1 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 1 | 4 | 4 | 4 | | 4 | 100.00 | A+ |
| 1022469 | 2 | 0 | 0 | 0 | 0 | 0 | 0*M | 2 | 0*M | 0 | 0*M | 4 | | 0 | | 0 | 9.87 | F |
| 1006180 | 3 | 1 | 3 | 0 | 3*L | 1 | 2*L | 3 | 3 | 3 | 1 | 4 | | 2 | | *M | 44.44 | F |
| 86829 | 4 | 1 | 4 | 0 | 4 | 4 | 1 | 3 | 4 | 4 | 1 | 4 | 12 | 2 | | 4 | 90.12 | A |
| 79432 | | | 3 | 3 | 3*L | 3 | 3 | 3 | 1*L | 2 | 1 | 4 | | 2 | | 3 | 63.88 | C |
| 72975 | 0 | 0 | 3 | 0 | 4 | 0 | 1*L | 4 | 1*L | 0 | 1 | 4 | | 3 | | 1 | 44.44 | F |
| 1010103 | 4 | 1 | 2 | 2 | 3*L | 3 | 0*M | 3 | 0*M | 3 | 0*M | 4 | | 1 | | 2 | 47.53 | F |
| 72875 | 4 | 1 | 3 | 4 | 4 | 4 | 3 | 4 | 2*L | 4 | 1 | 4 | | 4 | | 3 | 85.80 | A |
| 67775 | 4 | 1 | 3 | 0 | 4 | 2 | 0*M | | | 4 | 0*M | 4 | | 2 | | *M | 44.14 | F |
| 1010385 | 4 | 1 | 2 | 3 | 4 | 1 | 4 | 4 | 1 | 4 | 0*M | 4 | | 3 | | 3 | 72.83 | B |
| 74419 | 4 | 1 | 3 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 1 | 4 | 4 | 4 | | 4 | 97.53 | A |
| 1004273 | 3 | 1 | 2 | 3 | 3*L | 3 | 1*L | 2 | 2*L | 3 | 0*M | 4 | | 0 | | 2 | 44.44 | F |
| 1015937 | 4 | 1 | 2 | 2 | 4 | 2 | 3 | 3 | 2*L | 0 | 0*M | 4 | | 3 | | 2 | 61.11 | C |
| 74722 | 4 | 1 | 3 | 0 | 4 | 0 | 1 | 4 | 1*L | 0 | 1 | 4 | 4 | 1 | | 3 | 55.55 | D |
| 74295 | 2 | 0 | 2 | 2 | 4 | 0 | 1*L | 4 | 3*L | 4 | 1 | 4 | 5 | 2 | | 4 | 72.83 | B |
| 71052 | 4 | 1 | 2 | 3 | 3*L | 4 | 4 | 4 | 1*L | 4 | 0*M | 4 | | 4 | | 2 | 75.30 | B |
| 1010556 | 4 | 1 | 2 | 0 | 4 | 3 | 3*L | 4 | 2*L | 4 | 0*M | 4 | | 3 | | 3 | 71.60 | B |
| 1008835 | 3*L | 1*L | 2 | 3 | 1*L | 3 | 3*L | 0 | 3*L | 2 | 0*M | *M | | 2 | | 1 | 42.59 | F |
| 74486 | 4 | 1 | 2 | 3 | 4 | 3 | 1 | | 1 | 4 | 1 | 3 | 10 | 1 | | 3 | 72.35 | B |
| 71387 | | 1 | 0 | 0 | 3 | 2 | 0*M | 4 | 0*M | 4 | 1 | 4 | | 4 | | 2 | 59.07 | D |
| 74433 | 4 | 1 | 3 | 3 | 4 | 3 | 4 | 4 | 3 | 0 | 1 | 4 | | 3 | | 2 | 69.75 | C |
| 74477 | 4 | 1 | 3 | 2 | 4 | 3 | 4 | | 3 | 4 | 1 | 4 | | 2 | | 2 | 66.93 | C |
| **Assignment Averages** | **3.6** | **0.9** | **2.6** | **2** | **3.6** | **2.2** | **2.3** | **3.5** | **2.3** | **2.9** | **0.7** | **3.9** | **6.3** | **2.4** | | **2.5** | **65.15** | |

These are 6th period Introduction to Ag Chemistry grades from 1st semester. FFA and SAE are 10% of their grade and are entered into grades at the end of the semester.

**Appendix E: SAE Supervision Forms**

Central Valley is a large department and has many different teachers with different ideas of what is necessary for a good quality program. There has never been a standard project supervision form as long as I have been here. Previously, cost and consistency have limited attempts at implementing a chapter-wide program. All teachers keep track of student meetings and animal weights/ medication administration. Below are pictures of the binder I keep of weights, meeting dates, permission slips, and information. Next year, I will be transitioning to a paperless system using my iPad and a program that will keep track of weights and predict market weight based on ADG.





**Appendix F: FFA/ SAE Project statement in syllabus**

Below is a screen shot of my syllabus and its SAE/ FFA statement. All our classes in the ag department have the same statement to ensure continuity. Also, every teacher in the ag department grades record books and SAE participation as 10% of the total agriculture class grade.

**FFA Participation:**
**Please visit our chapter website for a full list of FFA activities and additional resources:**
**http://cvhsweb.ceres.k12.ca.us/academics/agriculture/c_v_h_s_f_f_a**

**All students are required to attend 4 distinctly different FFA activities per semester**. This participation is worth 10% of your grade. Please see the FFA calendar for a list of all FFA activities offered.
All students must establish a Supervised Agriculture Experience (SAE) project and record activities in their record book. SAE projects are any agriculturally related activity completed by the student that amounts to 50 hours outside class time. Projects may include, but are not limited to, plants raised at home or in the greenhouse, livestock or small animals raised for breeding or market (generally exhibited at the county fair), work experience at an agriculturally related company, ag mechanics or engine projects, and care of home pets or landscaping. Record of projects in the California Ag Record Books are used to earn awards and scholarships at the school, state, and national level.

**Appendix G: Program of Activities**

# Central Valley High School FFA

2015 – 2016

# Program of Activities

# Table of Contents

# Introduction

The FFA is a national organization for the students studying agriculture in public secondary schools under the provision of the National Vocational Education Acts.

An integral part of the program of education in agriculture in the public schools system of America, the FFA has become well-known in recent years. No national student organization enjoys greater freedom of self-government under adult council and guidance than the FFA. Organized in November 1928, it has served to motivate and vitalize the instruction offered to students of agriculture and to provide further training in citizenship and agricultural business.

The FFA is an intra-curricular activity having its origin and roots in a definite part of the school curriculum. Topics of discussion include how to construct and take an active part in public meetings, to speak effectively in public, to buy and sell cooperatively, to devise solutions for their own problems, to assume civic responsibilities, and to finance themselves. The foundation upon which the FFA organization is molded includes leadership, thrift, scholarship, improved agriculture, organized recreation, citizenship, and patriotism.

The FFA is a non-profit, non-political youth organization of voluntary membership, designed to take its place along with other agents striving for the development of leadership, the advancement of agricultural technology, and the improvement of life.

National headquarters for the FFA is located in the Agricultural Education Branch Office of Health, Education, and Welfare, Washington D.C. National Conventions are held annually in Louisville, Kentucky, and the California Association, with its headquarters in Sacramento.

The Central Region, one of six geographical regions of the California Association, encompasses Stanislaus, Merced, Mariposa, Mono, Tuolumne, San Joaquin, Calaveras, Yolo, Sacramento, El Dorado, and Amador Counties. The Region's annual conference is held during the month of November at a school located within the Region's boundaries.

In all levels of participation, students hold various offices and control the events of participation.

## President's Message

Dear FFA Members,

Central Valley FFA is excited for the upcoming year. This year, our main focus is reaching out to more FFA members in our school and members of our community. By increasing outreach on social media, we plan on increasing the amount of members participating in FFA events, competitions, and leadership events. We will utilize the effectiveness of Facebook, Instagram, print media, and word of mouth to inform and inspire more members about FFA Activities. These forms of media will allow us to not only reach out to FFA members, but also members of our community. We plan on having at least 2 major and influential community service events throughout the school year. With the community as our major supporter, we plan on dedicating more time and effort to our supporters.

Having a majority of the executive team being new members, we are excited for the new faces representing our chapter. Having a constitutional officer team and an executive committee, we will be able to accomplish much more this year. I am looking forward to another amazing year serving Central Valley FFA and I am proud to say that I am a part of this association.

Thank you for giving me this opportunity to be a servant leader to you,

Andrew

Central Valley FFA President

# <u>Officer's Page</u>

## 2015-2016 Chapter FFA Executive Team

President: Andrew -Senior

Vice President: Gabriella -Senior

Secretary: Brenda -Sophomore

Promotion Committee: Emileigh -Senior

Food and Fundraising Committee: Bailey -Sophomore

Treasurer: Emanuel -Senior

Reporter: Alondra -Junior

Sentinel: Wilber -Sophomore

Wrecking Crew: Victor -Senior

# Officer Team Goals

1. Meet as a team more often than Tuesday
    - Socials, dinners, etc.
2. To disperse at events, to not be "cliquey"
    - Talk to fellow members
    - Make everyone feel welcome
3. To disperse responsibilities evenly throughout officers.
    - Ensure that not only a few amount of officers are loaded down with responsibilities, but that everyone has even responsibilities.
4. Be tolerant and supportive of each team member.
    - Be nice to one another, no arguing
    - Be open to new ideas
5. Have productive officer meetings.
    - Arrive early
    - Stay focused
    - Accomplish goals for meeting

# 2015-2016 Chapter Goals

This year's officer team picked five goals to focus on for the upcoming school year at their officer retreat held in Twain Hart in July.

1. **Increase Community Service Involvement**
    a. Canned Christmas Tree Drive
    b. Diamond Bar Arena
2. **Increase Member Involvement**
    a. Be Fun with a variety of activities
    b. Be Relatable
    c. Advertising Meetings through social media, and videos
    d. Bulletin Board Updates
    e. Snacks/Incentives at Meetings
    f. Monthly Recognition in bulletin/newspaper
    g. 8th Grade Recruitment
    h. Greenhand Committee
    i. FFA Spirit Days
3. **Increase Agriculture Literacy**
    a. Ceres Agriculture Clinics
    b. Farm Visits/Days
    c. Did you know? In bulletin/announcements
    d. Social Media
    e. Fair Booth
4. **Increase Team Building/Bonding**
    a. Monthly Dinners
    b. Coco Moo
    c. Mid-Year Officer Retreat
    d. E-mail communications

# Calendar of Activities

**August**

| | |
|---|---|
| 5 | Stanislaus Farm Supply Farm to Fork Dinner |
| 8 | Farm Supply Picnic |
| 14 | Ice Cream Social |
| 19 | Welcome Back BBQ |
| 29 | Central Region SOLS |
| 28 | Football BBQ @CHS |

**September**

| | |
|---|---|
| 4 | Football BBQ @CHS |
| 9 | FFA Meeting Burrito Bingo |
| 22 | Greenhand Leadership Conference |
| 25 | Football BBQ @ CHS |

**October**

| | |
|---|---|
| 3-4 | Central Region COLC |
| 3-4 | Pumpkin Patch sales |
| 6 | Oakdale Opening & closing Invitational |
| 7 | FFA Meeting @ 3;15 |
| 10-11 | Pumpkin Patch sales |
| 14 | Tri Rivers Opening & Closing |
| 17 | Parli Pro Comp |
| 17-18 | Pumpkin Patch Sales |
| 23 | Football BBQ @ CHS |
| 24-25 | Pumpkin Patch Sales |
| 26-31 | National FFA Convention |
| 28 | FFA Bonfire @ CHS |
| 30 | Football BBQ @ CHS |
| 31 | Pumpkin Patch sale |

**November**

| | |
|---|---|
| 16 | Drive Thru BBQ sales begin |
| 16 | Fruit Tree Sales Begin |
| 17 | Pin Maker and Signature Sheet @ Lunch |
| 18 | FFA Degree Ceremony @ 6:30 |
| 20 | Central Region CATA |
| 20 | UC Davis |

**December**

| | |
|---|---|
| 1 | Sectional Region Activity |
| 2 | FFA Activity (Cookie decorating & contest) |
| 4 ` | BBQ forms due |
| 4 | Fruit trees forms due |
| 9 | Drive thru BBQ 4-6 pm |

14 Fruit trees arrive
17 Exec Team Potluck
17 Winter Retreat

**January**
13 FFA Meeting (Minute to Win it )
20 State Degree Scoring @ Gregori
28 Super Thursday @ Pitman

**February**
6 Arbuckle Field Day
6 MJC Parli Pro Invitational
10 Regional Prelims @ Galt
12 Regional speaking Finals
17 Fair Exhibitor & Parent meeting @ 6:30
19-20 MFE/ ALA in Modesto & Regional Officer Interview
21-27 National FFA Week
22 Sport Day LTA: Strongman
23 Staff Breakfast
23 Professional Dress Day: LTA Grass Ski & Dancing
24 Hero Day: Minute to Win it
25 Western Day: LTA: FFA member Lunch
26 CVHS/FFA Spirit Day:LTA: Tractor Pull
27 Central Region CATA/FFA Meeting

**March**
4 UC Davis Parli Pro
5 UC Davis Field Day
12 Chico state field day
16 FFA Meeting Dodge ball @ 3;15
19 Merced Field Day
21 State Degree Ceremony in Turlock
24 Occupational Olympics
26 Modesto Field Day

**April**
1 Regional Parli Pro
6 FFA Bonfire @ 6;30
8 FFA Plant Sale 3-6
9 FFA Plant Sale 8-2
10 FFA Plant sale 8-12
12 Sectional Activity TBD
13 FFA Meeting Elections @3;15
23 Fresno Field Day
23-26 State FFA Convention

**May**

| | |
|---|---|
| 7 | State Finals @ Cal Poly SLO |
| 13 | FFA Banquet @ 6 Pm |
| 18 | American Degree Scoring @ Turlock |
| 20 | Drive Thru BBQ Orders Due |
| 20-22 | Camp Sylvester |
| 21 | Ceres Ag Boosters Dinner Fundraiser |
| 25 | Drive Thru BBQ 4-6 |

**July**

| | |
|---|---|
| 13-23 | Stanislaus County Fair |

## *The National FFA Organization*

**Central Valley FFA** **209-556-1900**
**1440 Central Ave.**
**Ceres, CA 95307**

<u>Central Valley FFA</u>
<u>2015-2016 Budget</u>

| Fund Raisers: | Income: | Expenses: | |
|---|---|---|---|
| 1. Football BBQ Concessions | $2100 | $1200 | |
| 2. Fruit Tree Sale | $2500 | $1300 | |
| 3. Drive Through BBQ | $1600 | $800 | |
| 4. Plant Sale | $1850 | $500 | |
| 5. Catering | $2000 | $1000 | |
| 6. Graduation Plant Sale | $1850 | $450 | |
| 7. T-Shirt Sale | $100 | | $100 |
| | | Total $6900 | |

| Expenses | Expense | Income |
|---|---|---|
| 1. Conferences | $6000 | $4200 |
| 2. Fundraiser Food & Supplies | $8400 | $11500 |
| 3. Contests | $3000 | $400 |
| 4. Floral Supply | $4800 | $4800 |
| 5. Fair | $9300 | $8725 |
| 6. Meeting Supplies | $1000 | $0 |
| 7. Banquet | $1000 | $250 |
| 8. Misc. | $3500 | $7175 |

<u>Total -$6725</u>

Net $175

# American Degree Recipients

The FFA American Degree is awarded to members who have demonstrated the highest level of commitment to FFA and made significant accomplishments in their supervised agriculture experiences (SAEs)

2012
Cherise Azevedo - Diversified Agriculture

2013
Alexis Ulloa - Sheep Production

2014
Dominique Germann - Dairy Placement
Luis Alvarez - Sheep Production
William Bailey - Swine Production

# State Degree Recipients

The State FFA Degree is given to the top members of a State FFA Association, to receive a State FFA Degree members must meet the requirements listed in the Official FFA Manual.

2011
Katie Gaede
Katy Butrica

2012
Luis Alvarez
Wynter Bratenas
Dominique Germann
Alexis Ulloa

2013
Ernesto Cuevas
Marlen Diaz

2014
Vincent Avila
Kyle Bates
Samantha Castellanos
Raul Gontiz
Carina Partida
Alana Ramos
Maricela Yepez

2015
Emanuel Alvarez
Andrew Dias
Gabriella Germann

# FFA and Agricultural Education

When you put on an FFA jacket, you become part of a total agriculture education program that will connect you to exciting careers in the science, business and technology of agriculture. FFA is only one of three essential components of this system, all of which work together to provide you with the personal, academic and career experiences essential for your success.  Get to know the "three circles" that make this possible.

**Classroom/Laboratory Instruction-** Agriculture is rooted in science, math, business and technology. The time you spend in the classroom and school lad with you teacher will help you explore and master the information necessary to move forward with you career development. Get ready for exciting hands-on opportunities that make textbooks come alive!

**Supervised Agricultural Experience (SAE)-** Nothing takes your skills to highest level faster than putting them into practice. Through an SAE, you can create your own landscaping business, conduct a scientific research project that could change the world, grow crops or raise livestock, secure a meaningful job that provides insider experience related to your career choice, or learn how to make a difference in your community though civic engagement. Best of all, you can earn while you learn.

**FFA-** As an FFA member, you'll work on developing your potential for premier leadership, personal growth and career success. By participating in competitions, degree programs, state and national conventions, community service projects, summer camps and chapter committees, you'll grow in ways that take advantage of your talents and help you become the leader you were meant to be. The key to success in FFA is to get involved!

Make sure you're getting a complete Agricultural Education experience, and remember that it all works together. Talk with you agricultural teacher today and make plans to perform in all three arenas. Don't just settle for a high school diploma when you can get set for life.

# FFA Mission and Strategies


FFA makes a positive difference in the lives of students by developing their potential for **premier leadership, personal growth and career success through agriculture education**.

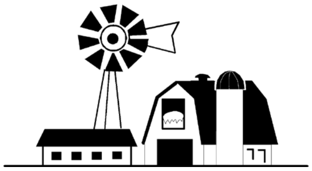
To accomplish this mission, FFA:

- Develops competent and assertive agriculture leadership
- Increases awareness of the global and technological importance of agriculture and its contribution to our well-being.
- Strengthens the confidence of agriculture students in themselves and their work.
- Promotes the intelligent choice and establishment of an agricultural career
- Encourages achievement in supervised agricultural experience programs
- Encourages wise management of economic, environmental and human resources of the community
- Develops interpersonal skills in teamwork, communications, human relations and social interaction.
- Builds character and promotes citizenship, volunteerism and patriotism.
- Promotes cooperation and cooperative attitudes among all people.
- Promotes healthy lifestyles.
- Encourages excellence in scholarship.

# FFA Emblem

Many organizations have logos they use as part of their identity. As with most logos, the FFA emblem is symbolic. It contains five separate elements. Each element represents items or ideals that are important to the organization and its members.

**The cross-section of an ear of corn** serves as the emblem's foundation, just as corn has historically served as a foundation crop in American agriculture. Corn is also a symbol of unity because it is native to America and it is grown in every state.
**The rising sun** appears in the center of the emblem and symbolizes progress in agriculture and the confidence FFA members have in the future.
**The plow** is a symbol of labor and tillage of the soil.
**The owl** represents knowledge and wisdom.
**The eagle** is perched on top of the emblem and served as a reminder of our freedom and ability to explore new horizons for the future of agriculture.
Finally, the words, **"Agriculture Education"** surrounding the letters "FFA" indicate that the FFA is an important part of the agricultural education program.



# FFA Creed

The FFA Creed is a basic statement of beliefs and a common bond between members. The creed was written by E.M. Tiffany and adopted at the 3$^{rd}$ National FFA Convention. It was revised at the 38$^{th}$ and 63$^{rd}$ conventions to reflect changes in FFA members and the agricultural industry.

## The FFA Creed

*I believe in the future of agriculture, with a faith born not of words but of deeds - achievements won by the present and past generations of agriculturists; in the promise of better days through better ways, even as the better things we now enjoy have come to us from the struggles of former years.*

*I believe that to live and work on a good farm, or to be engaged in other agricultural pursuits, is pleasant as well as challenging; for I know the joys and discomforts of agricultural life and hold an inborn fondness for those associations which, even in hours of discouragement, I cannot deny.*

*I believe in leadership from ourselves and respect from others. I believe in my own ability to work efficiently and think clearly, with such knowledge and skill as I can secure, and in the ability of progressive agriculturists to serve our own and the public interest in producing and marketing the product of our toil.*

*I believe in less dependence on begging and more power in bargaining; in the life abundant and enough honest wealth to help make it so--for others as well as myself; in less need for charity and more of it when needed; in being happy myself and playing square with those whose happiness depends upon me.*

*I believe that American agriculture can and will hold true to the best traditions of our national life and that I can exert an influence in my home and community which will stand solid for my part in that inspiring task.*

# FFA Colors and Motto

## Colors

The National FFA Organization chose national blue and corn gold as its official colors in 1929. As the blue field of our nation's flag and the golden fields of ripened corn unify our country, the FFA colors give unity to the organization.

## Motto

Many important things come in small containers. Although a diamond ring takes up a little space, it is extremely valuable. So it is with the FFA motto. The motto has just 12 words, but those words are powerful.

**LEARNING TO DO,**

**DOING TO LEARN,**

**EARNING TO LIVE,**

**LIVING TO SERVE**

# FFA Official Dress

One of the most unifying elements for any group is its uniform. In FFA, the uniform members wear to local, state and national functions is called official dress. It provides identity and gives the organization a distinctive and recognizable image.

## Proper Use of the FFA Jacket

- The jacket is to be worn only by members.
- The jacket should be kept clean and neat at all times.
- The back of the jacket includes only: a large official FFA emblem, the name of the state association and the name of the local chapter, district or area. The front of the jacket includes only: a small official FFA emblem, the name of the individual, one office or honor and the year of that office or honor.
- The jacket should be worn on official occasions with the zipper fastened to the top. The collar should be turned down and the cuffs buttoned.
- The jacket should be worn by members and officers on all official FFA occasions, as well as other occasions where the chapter or state association is represented. It may be worn to school and other appropriate places.
- The jacket should only be worn to places that are appropriate for members to visit.
- School letters and insignia should not be attached to or worn on the jacket.
- When the jacket becomes too faded and worn to wear in public, it should be discarded or the emblems and lettering should be removed.
- The emblems and lettering should be removed if the jacket is given or sold to a non-member.
- A member should act professionally when wearing the official FFA jacket.
- Members should refrain from use of tobacco and alcohol when underage and at all times when representing the FFA. In addition, members should exhibit their leadership qualities when they encounter substances including tobacco and alcohol and serve to discourage others from inappropriate behavior.
- All chapter degree, officer pins, and other award medals should be worn beneath the name on the right side of the jacket, with the exception that a single State FFA charm and American FFA key should be worn above the name or attached to a standard key chain. No more than three medals should be worn on the jacket; these should represent the highest degree earned, the highest office held and the highest award earned by the member.

## Official FFA Dress

- Official dress for female members is a black skirt, white blouse with blouse with official FFA scarf, black shoes, and official jacket zipped to the top. Black slacks may be worn for traveling and outdoor activities.
- The official dress for male members is black slacks, white shirt, official FFA tie, black shoes, black socks and the official jacket zipped to the top.

# FFA Code of Ethics

People are always observing you. Your actions when you wear the FFA jacket or represent the organization become part of the organization's image. To keep the image of the FFA and members sharp, delegates at the 1952 National FFA Convention adopted a Code of Ethics for FFA members to follow. The FFA Code of Ethics still protects the FFA image. It also guides members to make positive, healthy choices – and not only during FFA activities. The code of ethics guidelines are good to follow during all occasions and functions.

## The FFA Code of Ethics

FFA Members conduct themselves at all times to be a credit to their organization, chapter, school, community and family. I pledge to:

- Develop my potential for premier leadership, personal growth and career success
- Make a positive difference in the lives of others.
- Dress neatly and appropriately for the occasion.
- Respect the rights of others and their property.
- Be courteous, honest and fair with others.
- Communicate in an appropriate, purposeful and positive manner.
- Demonstrate good sportsmanship be being modest and winning and generous in defeat.
- Make myself aware of FFA programs and activities and be an active participant.
- Conduct and value a supervised agricultural experience program.
- Strive to establish and enhance my skills through agricultural education in order to enter a successful career.
- Appreciate and promote diversity in our organization.

# Leadership Conferences

**Greenhand Conference**
The Greenhand Conference is designed for freshman FFA members. Students will learn about the FFA organization and benefits of being a member. They will develop an individual personal plan for success and learn about careers in agriculture. This is a one day conference.

**Camp Sylvester**
This leadership retreat is designed for current chapter officers and committee chairs. Students will participate in trust and team building activities. Students who attend will return to the chapter with new skills to promote the chapter and be ready to encourage members to get involved. This is a three day conference.

**Chapter Officer Leadership Conference (COLC)**
COLC is designed for the current Chapter Officers. During this conference students will learn officer skills, team management, plan meeting activities and speaking skills. This is a two day conference.

**Made for Excellence (MFE)**
MFE is designed for sophomore and junior FFA members. The theme of the conference is personal growth. Participants focus on their talents, skills and willpower. Students who attend the conference will gain a level of confidence and competence that will enable them to positively influence peers and generate a new level of excitement. This is a two day conference.

**Advanced Leadership Academy (ALA)**
ALD is intended to produce young leaders who will return to the chapter motivated an well-prepared for solving problems and identifying growth opportunities. During this conference, ALD participants discuss issues such as recruiting new FFA members, fundraising, creating public awareness for FFA and improving chapter meetings. This is a two day conference designed for Juniors and Seniors.

**Washington Leadership Conference (WLC)**
WLC provides the ultimate leadership experience for members of the National FFA Organization. This program is designed for those members who are ready to take their leadership skills to a higher level. Located in our nation's capitol, WLC host seven, one-week conferences over the course of the summer.

**Sacramento Leadership Experience**
This conference is designed for Seniors. Students will learn about government operations, Agricultural industry, organization management and critical thinking. This is a three day conference, students must apply and be selected by the State FFA.

**State Convention**
The state FFA convention is the highlight of a year's activity by FFA members. Delegates from each chapter conduct business of the state association and elect officers to represent them during the coming year. This is a four day conference held in April.

**National Convention**

The national FFA convention is similar in purpose to a state FFA convention, but is held on a much larger scale.  It is now the larges annual meeting of students in the nation, with an attendance of over 50,000 members.

# S.A.E.

What if you could get classroom credit and FFA awards for doing what you like: experimenting with careers, earning money, building a resume and having fun? You can – with a Supervised Agricultural Experience (SAE) program. An SAE is a program you design to gain hands-on experience and develop skills in agricultural career areas that interest you.

You choose an SAE program that lets you discover, explore, experience and excel in careers. In the meantime, you gain skills and experience that pay off in areas of life. Your SAE program can lead you toward personal growth, premier leadership, and career success.

An SAE program is not just another class assignment or graduation requirement. You are truly in charge of your SAE! Although your agriculture teacher will help you learn related information and keep good records, the success or failure of your SAE is up to you. It's an exciting opportunity to prove your abilities to future employers – and to yourself.

## Central Valley FFA SAE Program

The Chapter will encourage all members to maintain a Supervised Agriculture Experience (SAE) program.

Members are encouraged to apply for local, regional and state proficiency awards.

Members are encouraged to apply for advanced degrees (i.e. State FFA Degree)

Members are encouraged to compete in the Local and Sectional Project Competition.

Members are encouraged to strive to improve and develop their SAE each year.

Encourage members to develop skills within their SAE through participation and appropriate judging teams.

Members are encouraged to provide support and help their fellow Chapter members.

# Market Hog Project Budget

## Estimated Expenses

| | |
|---|---|
| Cost of hog | $275.00 |
| Feed | 245.00 |
| Livestock Insurance | 25.00 |
| Fair Entry | 35.00 |
| Show Supplies/Shavings | 60.00 |
| Total Estimated Expenses | 640.00 |

## Estimated Receipts

| | |
|---|---|
| Sale of hog (240 lbs. @ $3.00/lb) | $720.00 © |
| **Total Estimated Receipts** | $720.00 |
| **Total Estimated Expenses** | - 640.00 |
| **Estimated Net Profit** | $80.00 |

# Market Lamb Project Plan Sheet

## Market Lamb Project Budget

### Estimated Expenses

| | |
|---|---|
| Cost of Lamb | $300.00 |
| Feed (grain and hay) | 150.00 |
| Livestock Insurance | 15.00 |
| Fair Liability Insurance | 35.00 |
| Show Supplies | + 20.00 |
| Total Estimated Expenses | $500.00 |

### Estimated Receipts

| | |
|---|---|
| Sale of Lamb (135 lbs. @ $4.00/lb) = | $540.00 © |
| **Total Estimated Receipts** | $540.00 |
| **Total Estimated Expenses** | - 500.00 |
| **Estimated Net Profit** | $40.00 |

# Market Goat Project Plan Sheet

## Market Goat Project Budget

### Estimated Expenses

| | |
|---|---|
| Cost of Goat | $200.00 |
| Feed (grain and hay) | 75.00 |
| Livestock Insurance | 17.00 |
| Fair Liability Insurance | 35.00 |
| Show Supplies | 20.00 |
| Total Estimated Expenses | $347.00 |

### Estimated Receipts

| | |
|---|---|
| Sale of Goat (100 lbs. @ $4/lb) = | $400.00 |
| **Total Estimated Receipts** | $400.00 |
| **Total Estimated Expenses** | - 347.00 |
| **Estimated Net Profit** | $53.00 |

©

# <u>Market Steer Project Plan Sheet</u>

## Market Steer Project Budget

**Estimated Expenses**

| | |
|---|---|
| Cost of animal | $1200.00 |
| Feed | 1200.00 |
| Show Supplies and Equipment | 10.00 |
| Insurance | <u>+ 90.00</u> |
| Total Estimated Expenses | 2500.00 |

**Estimated Receipts**

| | | |
|---|---|---|
| Sale of steer (1250 lbs. @ $2.00/lb) = | $2500 | © |
| **Total Estimated Receipts** | $2500.00 | |
| **Total Estimated Expenses** | <u>- 2500.00</u> | |
| **Estimated Net Profit** | 0.00 | |

# Poultry Meat Pen Project Plan

## Estimated Expenses

| | |
|---|---|
| Cost of Animal (8) | $0.00 |
| Feed | 20.00 |
| Total Estimated Expenses | $20.00 |

## Estimated Receipts

| | |
|---|---|
| Sale of Animal (2) | |
| Personal Sale= | 10.00 |
| Livestock Sale *Champion Only | 900.00 |
| | © |
| **Total Estimated Receipts** | $900.00 |
| **Total Estimated Expenses** | - 20.00 |
| **Estimated Net Profit** | $880.00 |

# Dairy Replacement Heifer Project Plan Sheet

## Dairy Replacement Heifer Project Budget

### Estimated Expenses

| | 1 Yr. Project | 2 Yr. Project |
|---|---|---|
| Cost of Animal | $1300.00 | $500.00 |
| Feed 600.00 | 1000.00 | |
| Show Supplies and Equipment | 75.00 | 75.00 |
| Veterinary Supplies | 25.00 | 75.00 |
| Insurance | 80.00 | 60.00 |
| Breeding Fees | --- | 25.00 |
| Total Estimated Expenses | 2080.00 | 1735.00 |

### Estimated Receipts

| | | |
|---|---|---|
| Sale of Heifer | $2900.00 © | $3000.00 © |
| **Total Estimated Receipts** | 2900.00 | 3000.00 |
| **Total Estimated Expenses** | - 2080.00 | 1735.00 |
| **Estimated Net Profit** | $720.00 | $1245.00 |

# Rabbit Pen Project Plan Sheet

## Rabbit Pen Project Plan
**Estimated Expenses**

| | |
|---|---|
| Cost of Animal (3) | $25.00 |
| Feed | 11.00 |
| Fair Liability Insurance | 0 |
| Fair Entry | 3.50 |
| Show Supplies | 5.00 |
| | |
| Total Estimated Expenses | $44.50 |

**Estimated Receipts**

Sale of Animal (3)
Livestock Sale $150

**The Students must provide their own BUYER for the Fair Auction.**

*Net Receipts:*
Livestock Sale (15lbs. @ 10$/lb) $ 150.00

*Supplies needed for the Fair:*
Towels, FFA Show Uniform, Feed and Bedding for the week.

# OH, Vegetable & Flower Project Plan Sheet

**Ornamental Horticulture, Vegetable and Flower Project Plan**

*Estimated Expenses:*

| | |
|---|---|
| Cost of Plants | $17.50 |

**The student must work 24 hours at the school gardens**.

*Estimated Receipts:*

| | |
|---|---|
| Premium from Fair | $225.00 |

*Net Receipts:*

| | |
|---|---|
| Premium from fair | $ 207.50 |

# Central Valley FFA Constitution

## ARTICLE I. - Name and Purpose

*Section A.* The name of this organization shall be known as the Central Valley – Ceres FFA Chapter.

*Section B.* The purposes for which this Chapter was formed are as follows:

1. To develop competent and assertive agricultural leadership.

2. To develop an awareness of the global importance of agriculture and its contribution to our well being.

3. To strengthen the confidence of students in themselves and their work.

4. To promote the intelligent choice and establishment of an agricultural career.

5. To stimulate development and encourage achievement in individual agricultural experience programs.

6. To improve the economic, environmental, recreational, and human resources of the community.

7. To develop competencies in communications, human relations and social abilities.

8. To develop character, train for useful citizenship, and oster patriotism.

9. To build cooperative attitudes among agriculture students.

10. To encourage wise management of resources.

11. To encourage improvement in scholastic ability.

12. To provide organized recreational activities for agriculture students.

## ARTICLE II.- Organization

*Section A.* The Central Valley Chapter of FFA is a chartered local unit of the California Association of FFA which is chartered by the National Organization of FFA.

*Section B.* This Chapter accepts in full the provisions in the constitution and bylaws of the California Association of FFA as well as those of the National Organization of FFA.

## ARTICLE III. - Membership

*Section A.* Membership in this Chapter shall be of three kinds: Active, Alumni, and Honorary as defined by the National FFA Constitution.

*Section B.* The Active Membership of this FFA Chapter shall transact all affairs within this Chapter.

*Section C.* Honorary Membership in this Chapter shall be limited to the Honorary Chapter FFA Degree.

*Section D.* Active Members in good standing may vote on all business brought before the Chapter. An active member shall be considered in good standing when:

1. They attend 6 of the local Chapter meetings.

2. They show an interest in, and take part in the affairs of the Chapter.

3. All bills are paid on time.

4. They are a true representative of the FFA as perceived by the Code of Ethics.

5. They are academically eligible to participate in activities according to the policy as established by the Ceres School District Board of Trustees.

*Section E.* Names of applicants for membership shall be filed with the Chapter Secretary.

## ARTICLE IV. - Emblems

*Section A.* The emblem of the FFA shall be the emblem for the Chapter.

*Section B.* Emblems used by the members shall be designated by the National Organization of FFA.

## ARTICLE V. - Membership Degrees and Privileges

*Section A.* There shall be four degrees that can be earned by an Active Member in this Chapter. These degrees are: Greenhand Degree, Chapter FFA Degree, State FFA Degree, and American FFA Degree.

*Section B.* All "Greenhands" are entitled to wear the regulation bronze emblem pin.
All members holding the "Chapter FFA Degree" are entitled to wear the silver emblem pin. All members holding the "State FFA Degree" are entitled to wear the regulation gold emblem charm. All members holding the "American FFA Degree" are entitled to wear the regulation gold key.

*Section C.* Minimum qualifications for obtaining the four degrees of Active Membership shall be those listed in the National FFA Constitution as amended by the State FFA Assn.

*Section D.* The minimum qualifications for the Greenhand Degree :

1. Attend 4 or more Chapter meetings, including the Greenhand Degree Meeting.
2. Attend 2 other activities at or above the Chapter level.
3. Be regularly enrolled in an agriculture class and have a S.A.E.P. plan .
4. Be familiar with the purposes of the FFA and the Chapter's Program of Work.
5. Have learned and can explain the meaning of the creed, FFA motto, and salute.
6. Can explain the proper use of the FFA Jacket.
7. Can identify the historical highlights of the FFA.
8. Have access to a FFA Manual.
9. Have submitted an application.

*Section E*. The minimum qualifications for the Chapter Degree:

1. Must have completed 50 hours and or earned $100.00 in a valid S.A.E.P. project.

2. Must have a valid project and up to date record book as designated by the Agriculture Teacher.

3. Must attend 5 or more Chapter meetings, including the Chapter Degree Meeting.

4. Be regularly enrolled in an agriculture class and have an active S.A.E.P.

5. Must have received the Greenhand Degree.

6. Must participate in at lease 3 chapter activities.

7. Must have led a group discussion for 15 minutes.

8. Have demonstrated 5 procedures of parliamentary law.

9. Have a satisfactory scholastic record.

10. Submit an application for the Chapter FFA Degree.

*Section F.* The minimum qualifications for the State FFA Degree.

1. Qualification for the State FFA Degree shall be those set forth in the Constitution of the National FFA Association.

## ARTICLE VI. - Officers

*Section A.* The Officers of the Chapter shall be as follows: President, Vice-

President, Secretary, Treasurer, Reporter, and Sentinel. The local Advisor(s) shall be the teacher(s) of agriculture at Central Valley High School. Each of the Officers has their designated duties; they are as follows.

1. ***The President*** shall preside over and conduct meetings according to accepted parliamentary procedure, call special meetings, keep members on the subject and within the time limits, appoint committees and serve as ex-officio member of them, call other officers to the Chair as necessary or desirable, represent the Chapter and speak on occasions, coordinate Chapter efforts by keeping in close touch with the other Officer and Advisor(s), and keep Chapter activities moving in a satisfactory manner, represent the Chapter on the Central Valley School Student ASB Council, and represent the Chapter at the National FFA convention or designate a replacement.

**2. *The Vice-President*** shall assist the President when needed, have charge of committee work, preside at meetings in the absence of the President, be prepared to assume the duties and responsibilities of the President, and obtain end of activity reports from the committee chairpersons.

3. ***The Secretary*** shall prepare and read the minutes of meetings, have available for the President the list of business for each meeting, attend to official correspondences, send out and post notices, count and record rising votes, prepare chapter records, keep the permanent records of the chapter, cooperate with the Treasurer in keeping accurate membership roll, issue membership cards, call meetings to order in the absence of a presiding officer, read communications to the members at meetings, and post the meeting agenda at least twenty-four hours in advance of the meetings.

4. ***The Treasurer*** shall receive and act as custodian of Chapter funds, collect assessments, send in Sectional, State, and National dues, assist in preparing an annual budget, keep the financial records of the Chapter, and pay out funds as authorized, prepare financial statements and reports, build up the Chapters financial standing, and submit in writing a financial report at each meeting. Handle any bills as follows: older than 15 days, student and parents will receive a billing; bills 20 days old, student will be called into a Conference with the Chapter Officers; any bills older than 30 days old, the student will be listed in poor standing and shall lose all rights as an Active Member until his/her bill has been paid and a hold will be placed on records and books.

5. ***The Reporter*** shall gather and classify Chapter news, prepare news notes and articles for publication or broadcast, contact local newspapers, send news to State and National publications, arrange for FFA participation in local radio and TV programs, and keep an up to date Chapter scrapbook with the assistance of the Chapter Historian. The Reporter shall submit the Chapter scrapbook for judging at the Spring Regional Meeting and shall prepare a Chapter Newsletter for publication with the assistance of the Advisor.

6. ***The Sentinel*** shall set up the meeting room and care of Chapter paraphernalia and equipment, attend the door during meetings and welcome visitors, see that the meeting room is kept comfortable, take charge of candidates for degree ceremonies, and assist the President in maintaining order.

7. ***The Historian*** The Historian shall develop and maintain a scrapbook of memorabilia to record the chapters history, research and prepare items of significance to the chapter, prepare displays of the chapter and submit article of past member to the media. They shall assist the reporter.

8. ***The Advisor(s)*** shall assist the officers in running the Chapter and advise them as the need arises.

9. Each Chapter Officer is required to participate in at least three leadership activities such as Parliamentary Procedure, Public Speaking, or a Judging Team.

10. Each Officer shall have basic knowledge of Parliamentary Procedure.

*Section B.* Officers of the Central Valley FFA shall be elected annually by majority vote of the members present at the Election FFA Meeting.

*Section C.* Chapter Officers must hold the Chapter FFA Degree or be in the position to receive the Chapter FFA Degree at the November FFA Meeting.

*Section D.* If there is a need to fill an Officer vacancy during the term, it shall be appointed by the Chapter Officers with assistance from the Advisor, with the exception of the President whose vacancy shall be filled by the Vice President. After any one office is appointed by the Chapter Officer Team, it is then the Advisor(s) duty to appoint any other officer during that particular term. A person cannot fill a position without their consent.

*Section E*. Any Chapter Officer placed on academic probation shall be allowed one academic quarter to bring there grade up. They must provide either Director with a grade check every two weeks with every teacher signature. If the grade does improve to the required GPA after the given quarter he/ she is to in writing, resign from office at the first appropriate FFA Chapter Officer meeting. The Chapter Officer Team then shall replace the vacant office according to the constitution.

*Section F*. Chapter Officers missing more than four Chapter meetings without giving a two-day notice shall be considered removed as an officer.

## ARTICLE VII. - Greenhand committee

*Section A.* The Greenhand Officers shall consist of freshman committee members that are assigned executive committee chairs.

It is up to the determination of the Executive commitee to asssemble a greenhand Committee. If decided, the Greenhand Committee shall consist of members that are assigned executive committee chairs.

*Section B.* Consists of, but is not limited to:

***Wrecking Crew***- shall set up meeting supplies and assist with clean up.

***Food and Fundraising***- assist the officers and advisers when refreshments are necessary.

***Web Master***- shall assist the reporter with social media and photograph chapter events.

***Bulletin Board Designer***- shall keep the bulletin board up to date with chapter news and events.

**Community Service**- shall organize community events alongside officers

**Publicity**- shall assist the officers with advertising and publicizing FFA activities and events.

*Section C.* The Greenhand Committees shall work with the officer team to strengthen member involvement and assist them in coordinating events that involve their respective chair.

*Section D.* Any Greenhand Committee Member placed on academic probation shall, in writing, resign from office at the first appropriate FFA Chapter Officer meeting. The Chapter Officer team then shall replace the vacant office according to the constitution.

*Section E.* Greenhand Committee Members missing more than four Chapter meetings without giving a two-day notice shall be considered removed as an member.

*Section F.* The Greenhand Committee shall be selected by agriculture advisors after completing an application.

## ARTICLE VIII. - Executive Committee

*Section A.* The Chapter Executive Committee shall be composed of the six Chapter Officers, Greenhand President, Historian, BOAC Chairman, Committee Chairman, Newsletter Chair, Web Master, Chapter Sweetheart, and the Advisor(s)

*Section B.* The Historian, BOAC Chairman, Newsletter Chair, Chapter Sweetheart, Web Master, and Committee Chairman shall be appointed by the Chapter Officers during the Chapter Officers retreat.

*Section C*. The Chapter Officers and Advisor(s) shall be the final authority on all decisions relating to the Chapter and shall be responsible or nominating the Honorary Chapter Farmer, selecting the recipients of the Certificates of Appreciation, and shall, when necessary, conduct special meetings open only to the Officers and Advisor(s).

*Section D.* ***The Historian*** along with the Chapter Reporter shall, be responsible for developing and maintaining the Chapter Scrapbook. The Historian is to attend all Executive and Chapter Meetings.

*Section E.* ***The Community Service Chairman*** shall be responsible for the Chapters efforts in organizing community service projects. The Community Service Chairman will attend all Executive and Chapter Meetings.

*Section F.* ***The Scrapbook Chair*** shall be responsible for designing, maintaining, and monthly Scrapbook pages of all activities done by the chapter at state, regional, chapter, and national levels. The Scrapbook Chair is to attend all Executive and Chapter Meetings.

*Section G.* ***The Wrecking Crew Chairman*** shall be responsible for all set up and clean up of chapter meeting and activities. The Wrecking Crew Chair is also in charge of maintaining meeting paraphernalia . The Wrecking Crew Chairman is to attend all Executive and Chapter meetings.

***The Publicity Chairman*** shall be responsible for the advertisement and publicity of all chapter events and activities.

*Section H.* ***The Web Master*** shall be responsible for designing and maintaining the
Chapter's Web Page.

*Section I.* A member of the Chapter Executive Committee that misses more

Than two Executive Committee meetings or two Chapter Meetings without providing a two-day notice shall be replaced.

*Section J.* Any member of the Chapter Executive Committee placed on academic
Probation shall, in writing, resign from office at the first appropriate FFA Chapter Officer Meeting. The Officer Team then shall replace the vacant office/committee chairman according to the constitution.

## ARTICLE IX. - Disciplinary Actions

*Section A.* Any Chapter Officer may be impeached by a two-thirds vote of the Chapter members present at any specially scheduled meeting. Possible reasons for
impeaching an officer include, but are not limited to: Not fulfilling duties as required by the Constitution, not portraying the proper image of an FFA Member as established by the Chapter Code of Ethics, losing respect of fellow Chapter Officers, Members, Advisors, or the Community. The Officer up for impeachment will go through an interview with an administrator and Agriculture Teachers.

*Section B.* Any officer missing more than four Officer Meetings, two FFA Meetings, and or breaking any part of the Officer Contract without notifying the Agriculture Advisor(s), with the exception of verifiable cause at least two days prior to the event shall be replaced as an officer at the next regularly scheduled Chapter Meeting.

## Article X - Meetings

*Section A.* Regular chapter meetings shall be held once a month during the school year. Special Meetings may be called at any time.

*Section B.* Any sophomore or Junior with a minimum of the chapter FFA Degree shall be eligible to be a delegate for the Chapter at the State FFA Convention.

*Section C.* The members present at a regular chapter meeting shall constitute a quorum and a quorum must be present at any meeting at which business is transacted or a vote taken committing the chapter to any proposal or action.

## Article XI - Amendments

*Section A.* Proposed amendments to the constitution must be presented to the members at a regular chapter meeting, posted on the bulletin board in the classrooms and voted on at the next regular meeting. Any constitutional amendment requires a 2/3 vote of the active members present and must not conflict with the bylaws of the State and or National Associations.

## Article XII – Letter and Cords

*Section A. Minimum Requirements for a Letter:*

A. Minimum enrollment in Agriculture for two years.
B. Must qualify and apply for the State FFA Degree.
C. Must have a 3.00 G.P.A. in ALL your Agriculture classes
D. Must have a 2.50 G.P.A. overall.
E. Must have attended six of the seven events below, please check the ones that you have completed:

1. Attend Camp Sylvester
2. Be a Delegate for the Regional Meeting or State FFA Conference
3. Participate in Sectional Project Competition
4. Attend Judging Contest or Event on a Judging Team
5. Must attend at least six FFA Meetings per year
6. Must attend the Chapter Banquet every year
7. Be a Green Hand or Chapter Officer or Committee Chairperson
8. Participate in the Stanislaus County Fair
9. Participate in at least two Communities Service Activities on Campus per year
10. Participate in a least two community service activities off campus per year
11. Participate in a least two community service activities off campus per year

F. All requirements must be verifies by the FFA Record Books

*Section B. Minimum requirements for a FFA Patch or FFA Bar:*

A. Same requirements for Letter except for B.
B. Must have the Chapter FFA Degree

*Section C. Requirements for the FFA Graduation Cords*

A. Must have a 3.00 G.P.A. in Agriculture and or overall school G.P.A.
B. Cord Colors:
   1. Blue and Gold – Holds the State FFA Degree
   2. Gold – Enrolled in Agriculture for four years and have completed the minimum requirement for a FFA Patch or FFA Bar
   3. Blue – Enrolled in Agriculture for three years and have completed the minimum requirement for a FFA Patch or FFA Bar

4. White – Enrolled in Agriculture for two years and have completed the minimum requirement for a FFA Patch or FFA Bar

C. Must attend 6 of the eleven events, please check the ones that you have completed:

1. Attend Camp Sylvester
2. Be a Delegate for the Regional Meeting or State FFA Conference
3. Participate in Sectional Project Competition
4. Attend Judging Contest or Event on a Judging Team
5. Must attend at least six FFA Meetings per year
6. Must attend the Chapter Banquet every year
7. Be a Green Hand or Chapter Officer or Committee Chairperson
8. Participate in the Stanislaus County Fair
9. Participate in at least two Communities Service Activities on Campus per year
10. Participate in a least two community service activities off campus per year
11. Participate in a least two community service activities off campus per year

D. Your FFA Record Books must verify all requirements.

## General Rules Governing Central Valley FFA Members at Chapter Activities And While Wearing the Official FFA Jacket

## *I Procedure*

A. Prior to entering a FFA activity governed by the rules or the acquisition of The official FFA Jacket, each FFA Member will read a copy of the rules and sign a statement indicating their intent to follow the prescribed rules.

B. Each student entering a chapter activity must be accompanied by an Instructor or chaperon, and this person must be with their students during the night, prevent noise and other disturbances that may interfere with the welfare of other individuals. Every effort must be made to maintain orderly, quiet and proper conduct at all times. Any violations will be considered cause for disciplinary action determined by the Chapter Executive Committee.

C. The activities that the Central Valley FFA Members will be allowed to participate in are outlined in the Chapter Program of Activities.

## *II. General Rules*

A. Members are prohibited from smoking, drinking, and doing illegal drugs while wearing the FFA Jacket, officially representing the organization, and or taking part in any official activity.

B. The use of, possession of, firecrackers or weapons or any piece of equipment hat may subject anyone to injury will be grounds for immediate expulsion from show or activity.

C. No member is to leave the grounds of an activity without the permission of their instructor. No vehicles are to be used at any time without the approval of the instructor in charge.

D. Ladylike and gentlemanly conduct is expected at all times. Obscene language and roughhousing will not be tolerated at any time.

E. Gambling in any from is strictly forbidden.

F. Students who are reported to the advisor for the neglect of livestock will be brought before the school and department administration for appropriate action.

G. Appropriate dress will be required at activities participated in by the FFA. All members shall be expected to use good judgement in dress and shall wear the recognized uniform for the members when applicable. The school dress code shall be enforced.

H. Any display of overly affectionate attention between boy and girl members shall be discouraged by advisors. Persistent abuse of this rule shall be cause for suspension from the show or activity.

I. Hair shall be clean, cut and neat in appearance to be decided by the advisors.

J. It is highly recommend that any items that are valuable, or will be a problem to lock up will be left at home.

## *III. Official FFA Jackets*

A. The jacket is to be worn only by active members.

B. The jacket should be kept clean and neat.

C. The jacket should have only a large emblem on the back and a small Emblem on the front. It should carry the name of the State Association and the name of the local chapter, district, or area on the back and the name of the individual and one office or honor on the front.

D. The jacket should be worn on official occasions with the zipper fastened to the top. The collar should be turned down and the cuffs buttoned.

E. The jacket should be worn by members and officers on all officials FFA Occasions, as well as other occasions where the chapter or state association is represented. It may be worn to school and other appropriate places.

F. The jacket should only be worn to places that are appropriate for Members to visit.

G. School letters and insignia of other organizations should not be attached to or worn on the jacket.

H. When the jacket becomes faded and worn, it should be discarded or the Emblems and lettering removed.

I. The emblems and lettering should be removed if the jacket is given or sold to a non-member.

J. A member always acts like a lady or gentleman when wearing the jacket.

K. Members should refrain from use of tobacco and alcohol while wearing the FFA jacket or officially representing the organization.

L. All chapter degree, officer and award medals should be worn beneath the name on the right side of the jacket, with the exception that a single State FFA Degree charm or American FFA Degree key should be worn above the name or attached to a standard key chain. No more than three medals should be worn on the jacket. These should represent the highest degree earned, the highest office held and the highest award earned by the member.

M. Violation of the above rules governing the use of the official FFA Jacket will Warrant the Executive Committee to revoke the member's ownership of the jacket.

## *IV. Fair Exhibits and Exhibitors*

A. You, your animal and your chapter are on exhibit during the entire show. You are expected to keep the exhibit area and adjacent aisles clean at all times.

B. Stalls must be cleaned, with old bedding put into the designated areas by 7:00 a.m. The aisles must be kept clean at all times, this if for safety and health of your project, as well as a feature of your exhibit.

C. Each exhibitor is responsible for their own projects at all times. If they Cannot be present they must have prior approval of their instructor to leave. The person designated to care for the animals must be present at he fair.

D. Destruction of property, not cooperating with employees of the show or Cooperating groups all add up to a bad image, not that of a FFA member; thus you will be expected to cooperate at all times. Exhibitors will be held responsible for damage to any facilities or equipment.

## *V. Dormitory*

A. Each fair has written dormitory as to the time each member is to check in. It is the member's responsibility to familiarize themselves with these rules abided by them.

B. You are expected to keep your dormitory are clean of refuse, you bed, and the bunk area policed.

## VI. Disciplinary Action

A. Individuals who have been found to have violated any of these rules will be subject to disciplinary action by the school and department administration.

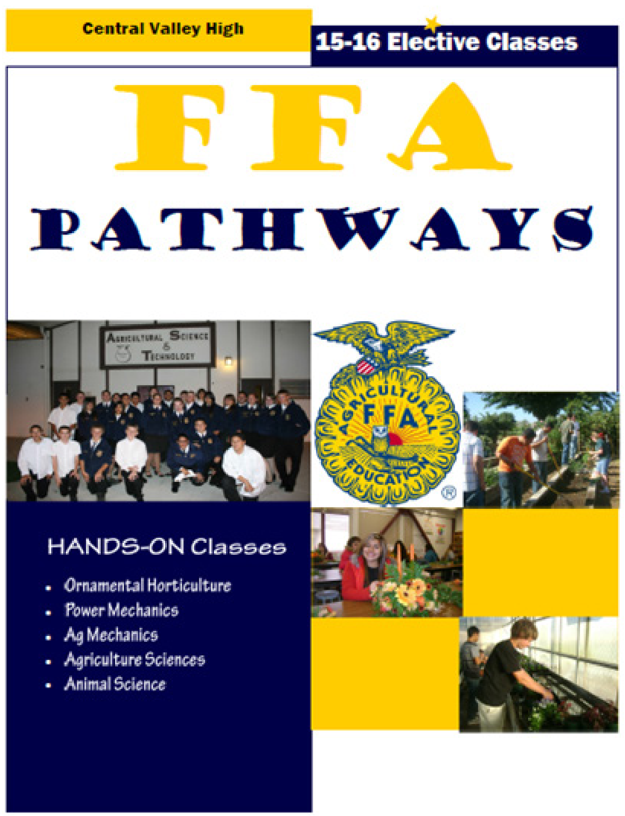
B. If the violation warrants it, the administration has the authority to immediately bar the individual or individuals involved from any further FFA activities, ownership of the official FFA jacket, and membership of the organization.

### *VII. Members in Good Standing*

A. Every member will start out in good standing. Only by their actions will their standing becomes unsatisfactory as deemed by the Agriculture Advisors.

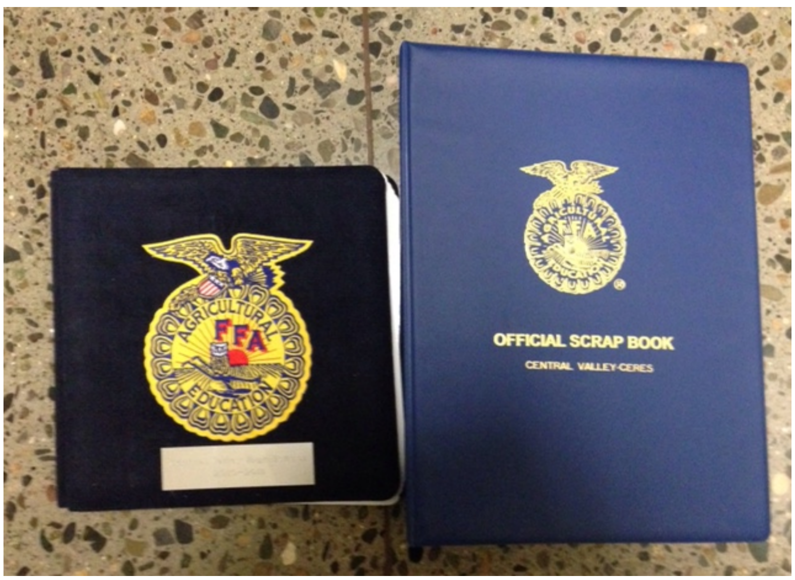
**Appendix H: Recruitment Flyer**

Central Valley Agriculture Department has always had a comprehensive recruitment process. Over the past 2 years this has been evolving based on the classes we are offering to each level. Eighth graders from feeder high schools visit the high school in January where one of the ag teachers will present introductory level classes. We used to present all the courses we offer but have since grown too large for the time frame given to present. All ag teachers also present to every ag classes in the Professional Development Room on campus about each course we teach in the department as a form of whole program recruitment and retention. We have also set up rotational presentations and visits for the ag biology students to explore electives they could take. We are now considering instituting an ag chemistry rotation to get sophomores into ag electives their junior year.




**Appendix I: Chapter Scrapbook**

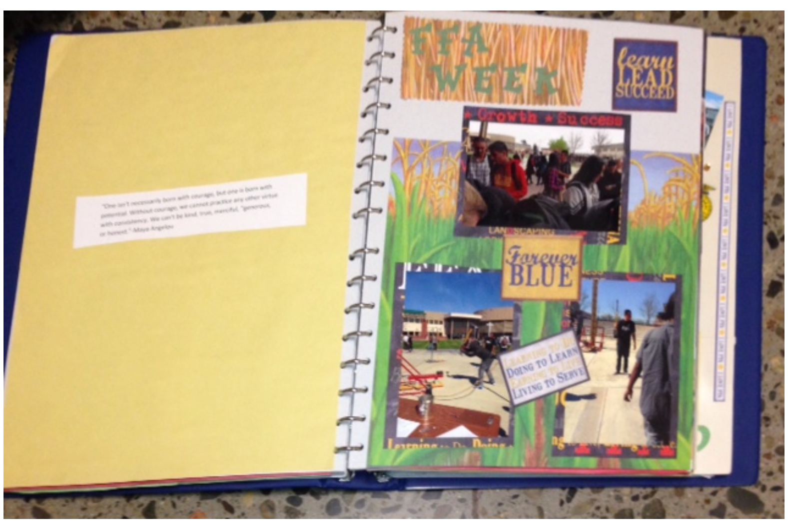
The chapter scrapbook has long since been a difficult component of leadership program. For many years we did not have a scrapbook. When I started at Central Valley I worked with our officers to develop a scrapbook. We realized that the book was a big job for the reporter to maintain on their own so we added a historian position to the officer team. Since that time we have struggled to find a student to take ownership of the scrapbook. Intermittently, officers will make an effort to keep accurate records of student achievements. 2 years ago we made a big push to create a more relevant historical record of the chapter. We started a chapter website and CVHS FFA Facebook page. Both serve as scrapbook and picture record collection. We also post achievements on the pages.
We still maintain the chapter scrapbook; however we find that updating our method of recruitment and reaching parent, students, and community members allows us to achieve the same goal.



The book on the left is our first scrapbook donated by a parent in 2011. The one on the right is our official scrapbook purchased by the chapter in 2012 to be eligible to compete in Chapter Scrapbook competitions.

Pages from the first chapter scrapbook.

Pages from the official chapter scrapbook.



Pages from the official chapter scrapbook.

Below is a screenshot of the homepage for the FFA website.


Below is a screenshot of the home screen for the CVHS FFA Facebook site.

## Appendix J: Summer Activities Calendar

Every summer at our officer retreat we plan summer FFA activities and the department has many activities related to the Stanislaus County Fair in July. Each teacher has an additional 43 days on their contract, some of which are worked over the summer. We are not regulated on days in the summer we are required to work but we must indicate on a work calendar how we will satisfy the additional 43 days. Below is a bulleted list of summer activities the ag department participates in:

- Officer retreat (June)
- CATA Summer Conference (June)
- Ceres Unified Ag and CV Department summer retreat (June)
- Fireworks booth (June/ July)
- Stanislaus County Fair (July)
- Project visits, Ceres Ag Center work days (June-August)

Below is a screen shot of our yearly work calendar.

| BISHOP, JESSICA | | | | TEACHER - AGRICULTURE | | | CERTIFICATED AG |
|---|---|---|---|---|---|---|---|
| FTE | FTE DAYS | EXTRA DAYS | ACTUAL DAYS | WORK LOCATION | TIMEPEACE SITE | CORRECT ??? | DATE SUBMITTED BY EMPLOYEE |
| 1.00 | 185 | 43 | 228 | CENTRAL VALLEY HIGH | CENTRAL VALLEY HIGH | :-) | |
| SUPERVISOR NAME: APPROVE BY ENTERING IN YOUR NAME HERE AND DATE SUBMITTED | | | | | DATE SUBMITTED | | ASST SUPT APPROVAL |
| | | | | | | | |

Calendar starts with 180 student days as "W" & 5 Prof. Dev/Tchr Work Days as "T" & "P" (Add "W" and "E" to balance to Actual Days) W = work day BLANK= non-

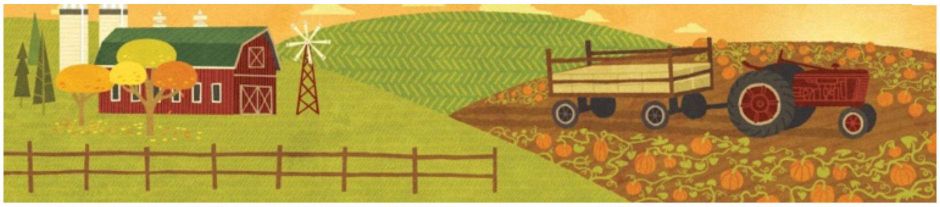
IMPORTANT: For each non-working day press the "DELETE" key (not the space bar) and leave space blank. T=Tchr Wrk Day P=Prof.Wrk Day E=Extra Work Day NH = Non-PD

| JULY | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | P.DEV./T.WK REQ.WK | WORK DAYS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | W | W | W | W | | | W | W | W | W | W | W | W | W | W | W | W | W | W | W | W | | | | | | | | | | | 0 | 19 |
| AUGUST | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | |
| | | | | W | W | W | W | W | | | P | P | W | W | W | | | W | W | W | W | W | W | | W | W | W | W | W | | | 2 | 19 |
| SEPTEMBER | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | | | |
| | NH | W | W | W | W | | | W | W | W | W | W | | | W | W | W | W | W | | | W | W | W | W | W | | | W | W | | 0 | 21 |
| OCTOBER | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | |
| | W | W | W | | | W | W | W | W | W | | | W | W | W | W | W | | | W | W | W | W | W | | | W | W | W | W | P | 1 | 22 |
| NOVEMBER | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | | | |
| | | | W | W | W | W | W | W | | | NH | W | W | W | | | W | W | W | W | W | W | | W | W | W | NH | NH | | | | 0 | 18 |
| DECEMBER | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | |
| | W | W | W | W | W | | | W | W | W | W | W | W | | W | W | W | W | T | | | | | NH | NH | | | | | | NH | 1 | 15 |
| JANUARY | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | |
| | NH | | | | | W | W | W | W | | | W | W | W | W | W | | | NH | W | W | W | W | | | W | W | W | W | W | | 0 | 18 |
| FEBRUARY | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | | | | | |
| | | W | W | W | W | W | | | NH | | | | | | | NH | W | W | W | W | | | W | W | W | W | W | | | | | 0 | 14 |
| MARCH | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | |
| | | W | W | W | W | W | | | W | W | W | W | W | | | W | W | W | W | W | | | W | W | W | W | W | | | W | W | 0 | 22 |
| APRIL | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | | | |
| | W | W | NH | | | | | | | | | | W | W | W | W | W | W | W | W | W | W | W | W | | | W | W | W | W | | 0 | 18 |
| MAY | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | | |
| | W | W | W | W | W | W | W | W | | | W | W | W | W | W | | | W | W | W | W | W | | | NH | W | W | W | W | | | 0 | 22 |
| JUNE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | | | |
| | W | W | W | W | T | W | W | | W | W | W | | | | | | | | | | W | W | W | W | W | W | | | | | | 1 | 15 |

| | | |
|---|---|---|
| **EMPLOYEE**: ADD "W" TO EQUAL THE CORRECT # OF WORK DAYS, THEN SAVE COMPLETED FORM AND EMAIL TO YOUR SUPERVISOR AS AN ATTACHMENT. **(USE "DELETE" AND NOT "SPACE" TO REMOVE A "W")** | TOTAL DAYS WORKED | 228 |
| **SUPERVISOR**: Review calendar and verify that the "TOTAL DAYS WORKED" match the "# OF SCHEDULED WORK DAYS". Upon approval, complete the "SUPERVISOR'S NAME" and "DATE SUBMITTED" fields above. Close file...when prompted to save, press YES and forward email to cbrowning@ceres.k12.ca.us | REQUIRED WK. DAYS: 5 | WORK DAYS: 223 |

## Appendix K: Graduate Follow-up Survey and Data

Central Valley has never conducted a formal graduate survey. One of the additions to this school year will be conducting a true graduate survey in May of our seniors. We are looking forward to learning what our students value about our program and what ideas they have for improving the courses and program. We also will have a mechanism to establish a lasting relationship with the students. Below is a copy of the graduate follow up survey that will be distributed and collected this May via Google Forms.



# Central Valley Ag Department Graduate Follow-up

Your username (**jcardoso@ceresusd.net**) will be recorded when you submit this form.
Not **jcardoso**? Sign out
* Required

**What will you plans be for after you graduate high school? ***

- [ ] Attending 4 year university
- [ ] Attending 2 year college (community or junior college)
- [ ] Trade school
- [ ] Military
- [ ] Working Full Time
- [ ] Working Part Time
- [ ] Not Working
- [ ] Other: ______

**If attending college or university, is your major ag related?**

[ ▾ ]

**If working, what type of business or industry are you employed?**

please also include your job title

[ ]

**Which statement best applies to your present occupation? ***

[ ▾ ]

**How would you rate training received in the agriculture program? ***

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| poor | ○ | ○ | ○ | ○ | ○ | excellent |

### How would you rate the career guidance and counseling you received in the agriculture program? *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| poor | ○ | ○ | ○ | ○ | ○ | excellent |

### Please check the following areas you feel are valuable components of FFA. *

- ☐ officer and committee chairman experience
- ☐ judging teams and contests
- ☐ advanced degree and proficiency awards
- ☐ participation in chapter activities, working with others
- ☐ livestock raising, shows, fairs, ect.
- ☐ Other: ______

### What were the most valuable aspects of the SAE projects? *

choose all that apply.

- ☐ Learning skills related to future ag employment
- ☐ Development of responsibility
- ☐ learning record keeping
- ☐ Other: ______

### Please rate the facilities in the agriculture program *

check all that apply.

- ☐ overcrowded
- ☐ modern
- ☐ adequate space provided
- ☐ out of date
- ☐ Other: ______

### Please rate the equipment in the agriculture program. *

choose all that apply

- ☐ modern
- ☐ well-maintained
- ☐ adequate amount of equipment for all students
- ☐ out of date
- ☐ poorly maintained
- ☐ Other: ______

### Please note any suggestions you have for improving the instructional program, including classroom, shop, greenhouse, school farm, FFA, SAE, teaching methods used, facilities/ equipment.

# Comprehensive Program Plan

**Central Valley High School**

# Table of Contents

# A. Job Market Descriptions

## Job Market Description

Ceres, California

From Wikipedia, the free encyclopedia

Ceres is a city in Stanislaus County, California. The population was 45,417 at the 2010 U.S. Census, up from 34,609 at the 2000 U.S. Census. It is part of the Modesto Metropolitan Statistical Area.

Ceres is located in the San Joaquin Valley along State Route 99, south of Modesto and north of Turlock in Stanislaus County. Ceres is named after the Roman goddess of agriculture.

The newspaper in Ceres is called The Ceres Courier.6 It has been in publication since 1910. The offices of the Ceres Courier were relocated from an address in downtown Ceres in 2012. It has since combined day-to-day operations with its sister paper, The Turlock Journal, in Turlock, CA. Jeff Benziger was appointed Editor in 1987. There is also a Spanish-language paper.

Ceres hosts annual events at different times of the year. Spring brings the Ceres Street Faire on the first weekend in May. Concert in the Park is a regular summer event. Halloween Fun Festival marks the Fall followed by the colorful, and much-attended, Christmas Tree Lane opening ceremony.

**Demographics**

As of the 2000 U.S. Census,15 there were 34,609 people, 10,435 households, and 8,535 families residing in the city. The population density was 4,988.6 people per square mile (1,925.4/km²). There were 10,773 housing units at an average density of 1,552.8 per square mile (599.3/km²). The ethnic makeup of the city was 64.50% White, 2.75% African American, 1.40% Native American, 5.04% Asian, 0.38% Pacific Islander, 20.40% from other races, and 5.53% from two or more races. Hispanic or Latino of any race were 37.89% of the population.

There were 10,435 households out of which 48.6% had children under the age of 18 living with them, 59.8% were married couples living together, 15.7% had a female householder with no husband present, and 18.2% were non-families. 14.1% of all households were made up of individuals and 6.0% had someone living alone who was 65 years of age or older. The average household size was 3.31 and the average family size was 3.62.

In the city the population was spread out with 34.4% under the age of 18, 10.1% from 18 to 24, 30.0% from 25 to 44, 17.5% from 45 to 64, and 8.1% who were 65 years of age or older. The median age was 29 years. For every 100 females there were 97.0 males. For every 100 females age 18 and over, there were 92.8 males.

The median income for a household in the city was $40,736, and the median income for a family was $43,587. Males had a median income of $35,109 versus $24,317 for females. The per capita income for the city was $14,420. About 10.1% of families and 12.9% of the population were below the poverty line, including 14.6% of those under age 18 and 10.2% of those age 65 or over.

The 2010 U.S. Census16 reported that Ceres had a population of 45,417. The population density was 5,663.2 people per square mile (2,186.6/km²). The ethnicmakeup of Ceres was 26,217 (47.7%) White, 1,185 (2.6%) African American, 609 (1.3%) Native American, 3,093 (6.8%) Asian, 346 (0.8%) Pacific Islander, 11,463 (25.2%) from other races, and 2,504 (5.5%) from two or more races. Hispanic or Latino of any race were 25,436 persons (66.0%).

The Census reported that 45,064 people (99.2% of the population) lived in households, 293 (0.6%) lived in non-institutionalized group quarters, and 60 (0.1%) were institutionalized.

There were 12,692 households, out of which 6,876 (54.2%) had children under the age of 18 living in them, 7,311 (57.6%) were opposite-sex married couples living together, 2,211 (17.4%) had a female householder with no husband present, 1,053 (8.3%) had a male householder with no wife present. There were 976 (7.7%) unmarried opposite-sex partnerships, and 76 (0.6%) same-sex married couples or partnerships. 1,586 households (12.5%) were made up of individuals and 628 (4.9%) had someone living alone who was 65 years of age or older. The average household size was 3.55. There were 10,575 families (83.3% of all households); the average family size was 3.84.

The population was spread out with 14,623 people (32.2%) under the age of 18, 5,108 people (11.2%) aged 18 to 24, 12,506 people (27.5%) aged 25 to 44, 9,667 people (21.3%) aged 45 to 64, and 3,513 people (7.7%) who were 65 years of age or older. The median age was 29.4 years. For every 100 females there were 97.9 males. For every 100 females age 18 and over, there were 93.9 males.

There were 13,673 housing units at an average density of 1,704.9 per square mile (658.3/km²), of which 8,010 (63.1%) were owner-occupied, and 4,682 (36.9%) were occupied by renters. The homeowner vacancy rate was 2.5%; the rental vacancy rate was 8.2%. 27,776 people (61.2% of the population) lived in owner-occupied housing units and 17,288 people (38.1%) lived in rental housing units.

**Government**

In the California State Legislature, Ceres is in the 12th Senate District, represented by Republican Anthony Cannella, and in the 21st Assembly District, represented by Democrat Adam Gray.17

In the United States House of Representatives, Ceres is in California's 10th congressional district, represented by Republican Jeff Denham.

**Economy**

Ceres is home to the Bronco Wine Company, makers of Charles Shaw wine, also known as "Two-Buck Chuck".

# CERES

ALLIANCE

| | |
|---|---|
| City of Ceres, California | www.ci.ceres.ca.us |
| Year Incorporated | 1918 |

## Population

| | |
|---|---|
| January 1, 2012 estimate | 45,854 |
| Percentage Increase since 2000 Census | 32.5% |
| 2010 Census | 41,678 |
| 2000 Census | 34,609 |

## Households

| | |
|---|---|
| January 1, 2012 estimate | 12,699 |
| 2010 Census | 12,692 |
| 2000 Census | 10,435 |
| Percentage Increase from 2000 to 2010 | 21.6% |
| Annualized Growth Rate 2000 to 2010 | 2.0% |
| Persons per Household (2012) | 3.58 |
| Persons per household (2010) | 3.28 |
| Persons per Household (2000) | 3.31 |

## Median Household Income

| | |
|---|---|
| 2008-2010 estimate | $46,883 |
| 2000 Census | $40,736 |
| 1990 Census | $30,876 |

## Housing Units

| | |
|---|---|
| January 1, 2012 estimate | 13,681 |
| 2010 Census | 13,673 |
| 2000 Census | 10,773 |

| | |
|---|---|
| Taxable Sales in 2010 ($ In 000s) | $398,992 |
| Taxable Sales in 2009 ($ In 000s) | $393,321 |

## Public Schools

Ceres Unified School District

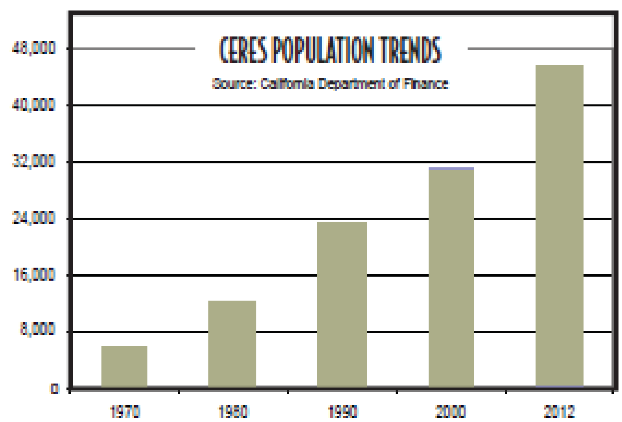
www.ceres.k12.ca.us

| | |
|---|---|
| District Enrollment (2011-2012 Year) | 12,532 |
| Kindergarten | 1,101 |
| Elementary School (Grades 1-8) | 7,778 |
| High School (Grades 9-12) | 3,653 |

Ceres is an active and growing community of over 45,000 people that still maintains a small neighborhood feel. The City is located just south of Modesto in one of the richest and most diverse agricultural regions of Stanislaus County. Even the name Ceres originates from the Roman goddess of agriculture. It is home to the annual Ceres Street Faire held every May. A vibrant local economy based in agricultural production, together with various supporting industries and manufacturing, make Ceres a city on the rise. To find out more about Ceres visit www.ci.ceres.ca.us or the Ceres Chamber of Commerce website www.cereschamber.org.

## ZONE 40

Depending on the business address an employer may be eligible to receive key tax incentives through the Stanislaus Enterprise Zone. Incentives that can improve their bottom line and help them reduce their cost of doing business. Portions of Ceres are included in the Stanislaus Enterprise Zone 40. Check the Alliance website for address ranges at www.stanalliance.com.




## Major Employers

| Employer | Description | Employees* |
|---|---|---|
| Ceres Unified School District | School District | 1,300 |
| M.A. Garcia Agrilabor | Labor Contractor | 481 |
| WinCo Foods | Distribution Center | 475 |
| Bronco Wine | Winery | 350 |
| Wal-Mart | Retailer | 320 |
| City of Ceres | City Government | 202 |
| Kingspan Insulated Panels | Building Systems | 92 |
| Superior Fruit | Fruit & Almonds | 79 |
| Ace Lath & Plaster | Contractor | 70 |
| Stiles Custom Metal | Metal Doors & Frames | 63 |

* Reflects peak seasonal levels where applicable and may include estimates.

Modesto Occupational Projections

# Central Valley High School (Ceres, California)

From Wikipedia, the free encyclopedia

Central Valley High School
Address
4033 Central Avenue
Ceres, California, 95307
United States

**Information**

| | |
|---|---|
| Type | Public |
| Motto | Go Hawks! |
| Founded | 2004 |
| School district | Ceres Unified School District |
| Principal | Dan Pangrazio |
| Enrollment | 1682 |
| Color(s) | Green Maroon |
| Nickname | Hawks |
| Website | cvhsweb.ceres.k12.ca.us |

Central Valley High School (also known as Central Valley or CV) is an American public high school for students between the 9th and 12th grade. It is a large school, with over 1,500 students. It was founded in 2004 to help alleviate the enrollment stress on cross-town Ceres High School. Central Valley is located in Ceres, California in the Central Valley of California, and is the second high school in that city. The school curriculum is based on preparing all students for college with the graduation requirements matching the entry requirements of the University of California and California State University. The school offers 15 Advanced Placement courses with little prerequisite conditions in contrast to cross-town rival, Ceres High School, who offers less AP Courses and strict prerequisites. As of 2015, the school is ranked the best high school in Stanislaus County by the U.S. News and World Report magazine.

Central Valley High School is one of two traditional high school in the district. Built in 2004, it is fed by two junior high schools and seven elementary schools. The ethnic trend of increased numbers of Hispanic students continues, with 72.0% of students Hispanic, 18.0% White, 3.0% African-American, 1.0% American Indian, 5.0% Asian-American, 1.0% Pacific Islander, and 1.0% Filipino-American. The number of students qualifying for free or reduced lunch is 76.0%. 23.0% of the students are English learners. 4% of the students in the school are GATE students. The school is rated a 5 out of 10 for all schools in California. However, in schools similar to Central Valley High, the school is rated a 10 out of 10.

**Academics**

Central Valley High School has three levels of classes. The first is College Prep (CP), the second is Honors/Advance and the third is Advanced Placement. Honors and Advanced Placement (AP) are completely voluntarily while College Prep are mandatory and the lowest level of classes available at Central Valley. The following AP classes are available at Central Valley High School: AP European History, AP US History, AP United States Government and Politics, AP

Spanish Language, AP Spanish Literature, AP English Language, AP English Literature, AP Studio Art, AP Calculus AB, AP Statistics, AP Biology, AP Chemistry, AP Environmental Science and AP Psychology. Students have the option of taking up to six AP courses depending on their scheduling needs but they must take the end of the year exam for each AP class.

**Rankings**

Central Valley High School was ranked the number one high school in Stanislaus County and the 301 best high school in the state of California by the 2015 U.S. News & World Report high school rankings.

# B. Targeted Occupations

# AGRICULTURE DEPARTMENT PATHWAYS

| | Plant Pathway | Animal Pathway | Mechanics Pathway | Agriscience Pathway |
|---|---|---|---|---|
| Freshmen | Introduction to Plant and Animal Agriculture | Introduction to Plant and Animal Agriculture | Introduction to Ag Mechanics | Agriculture Biology/<br>Advanced Agriculture Biology |
| Sophomore | Introduction to Plant Production or Introduction to Floriculture | Agriculture Chemistry (Prerequisite: Algebra) Or And/Or Animal Science | Ag Welding<br>Introduction to Power Mechanics | Agriculture Chemistry<br>(Prerequisite: Algebra) |
| Junior | ROP Plant Production (1 or 2 period)<br>Or Advanced Floriculture | Animal Science<br>Or Vet Science | ROP Introduction to Power Mechanics or<br>ROP Welding | Agriculture Systems Management |
| Senior | ROP Plant Production (1 or 2 period)<br>Or Advanced Floriculture | Veterinary Science | ROP Power Mechanics<br>ROP Welding<br>ROP Fabrication | Food Science |
| Post Secondary | Possible College Majors:<br>Agribusiness<br>Plant Sciences<br>Environmental Sciences<br>Soil Science<br>Forestry and Natural Resources | Possible College Majors:<br>Veterinary Science Nutrition<br>Animal Science<br>Agribusiness<br>Dairy Science<br>Animal Biology | Possible College Majors:<br>Environmental Engineering<br>Industrial Technology<br>Bio-Resource Engineering<br>Agriculture Engineering<br>Landscape Architecture/ Engineering | Possible College Majors:<br>Nutritionist<br>Food Scientist<br>Pest Control Advisor<br>Wine Production<br>Produce or food production<br>Ag Chemist |

# C. Total Program Goals and Objectives

## Total Program Goals and Objectives

Central Valley Department Goals 2015

**Overview:**

The long term vision of the Ag Department is to achieve the following for each pathway:

- Agriscience pathway- using the fund from the new California Pathways Grant to propose a complete series of courses utilizing the new UCCI developed Ag science curriculum for Sustainable Ag Biology, Agriculture and Soil Chemistry, Agriculture Systems Management, and Food Science as a capstone science elective. All other classes are UC/ CSU approved for area D lab science in life, physical, and interdisciplinary science. Food science would be an elective life science.
- Mechanics pathway- additional training is needed to utilize the new plasma cam and CNC router. Using the Pathways grant, a trainer will be hired for 2 days of 1-on-1 training to use both machines.
- Animal Science Pathway- the department would like to develop completion certificates that will be recognized in the industry upon completion of the capstone course. There is also an immediate need to finish the animal facilities at the new district farm. Classes are already utilizing the buses to get to the farm and gain hands on experience. The need it to have animals out there year round so classes can be out there 2-3 days a week. We would like to propose an Introduction to Agriculture pathway that would introduce freshmen to both plant and animal science concepts. This would function as a foundation class for both the Animal Science Pathway and the Plant Production Pathway.
- Plant Science Pathway- There is an increase in enrollment numbers this year in plant production and advanced floriculture. The need is to establish a strong pathway for students to complete. We would like to propose an Introduction to Agriculture pathway that would introduce freshmen to both plant and animal science concepts. This would function as a foundation class for both the Animal Science Pathway and the Plant Production Pathway. Students would complete the pathway by taking Plant Production and a Adv. Plant Production class or the Intro to Floral and Advanced Floral classes. Industry partners will be formed to allow student to job shadow and inter in this pathway.
- For FFA- an additional van and truck should be purchased (split cost and use between Ceres Ag and Central Valley Ag) in order to increase access and involvement of students in leadership and career development events.

**Steps:**

**Fall 2015**

- propose Ag Systems Management, Food Science, Adv Plant Production and Introduction to Agriculture courses to site steering and district.

- Arrange for trainer to come to CV for training on Plasma Cam and CNC router and subs for Moncrief and Traini.
- approach Heather Adney at Cesar Chavez about doing similar workshop trainings with her students like we have been doing at Blaker.
- Meet with industry partners to establish career readiness agreements.

**Spring 2016**

- recruit students for new courses (Intro to Ag, ASM, and Food Science)
- Recruit and hire an additional Ag teacher to teach additional sections
- begin textbook adoption process for Intro to Ag, ASM and Food Science courses (if needed).
- Begin Construction on the new swine facility at the district farm.
- Purchase new ag truck with MJC Animal Science pathway grant money.
- Purchase van using regional pathway grant money
- Purchase equipment and materials for the food science and ASM courses using regional pathway grant money.
- Plan dates for workshops at Blaker and Chavez for fall.
- Apply for CTE Incentive Grant.

**Fall 2016**

- Implement UCCI curriculum for Ag Biology.
- Begin teaching Intro to Ag, ASM, Adv Plant Production and Food Science.
- Begin workshops at both Blaker and Chavez.

**<u>Equipment needed (most of which can be paid for with existing or incoming pathway grant money)</u>**

- new ag van
- new ag truck
- more panels and gates
- stock tanks and water supply at new farm
- rubber mats for the swine unit
- dehydrators (food science)
- hot plates and pots (food science)
- table top convection ovens (food science)
- Loader for tractor
- New cultivation tractor
- Spray equipment
- Refrigeration unit at Ag Center
- Weed Management implements

**<u>Needs from District</u>**

- A classroom appropriate for food science and ASM (outlets and a sink) at CV (Science Lab)
- To get the architect and engineer plans for both the swine unit and multi species barn
- help with applying for the CTE grant
- Part time CUSD employee help at the Ag Center (Weed Control and Spraying)

# D. Program Description of Included Courses, SOE and Leadership

## Program Description of Included Courses, SOE and Leadership

SUSTAINABLE AG BIOLOGY CSU/UC (d)

GRAD CREDIT: Life Science 9th –12th grade

Sustainable Agriculture Biology is a one year course designed to integrate biological science practices and knowledge into the practice of sustainable agriculture. The course is organized into four major sections, or units, each with a guiding question. Unit one addresses the question, What is sustainable agriculture? Unit two, sustainable agriculture fit into our environment? Unit three, What molecular biology principles guide sustainable agriculture? Unit four, How do we make decisions to maximize sustainable agricultural practices within a functioning ecosystem? Within each unit specific life science principles will be identified with agricultural principles and practices guiding the acquisition of this knowledge, culminating in the development of a sustainable farm model and portfolio of supporting student research. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Prerequisite: Math I enrollment.

P ADVANCED AG BIOLOGY CSU/UC (d) GRAD CREDIT: Life Science 9th –12th grade

This accelerated rigorous course is designed for Honors/Gate agriculture students who are college-bound. This course involves in-depth study of cellular organization and processes, reproduction of plants and animals, genetics, evolution, physiology of agriculture plant and animals and ecology. Emphasis will be placed on investigation, analysis, and critical thinking of course contents through labs and agriculture research projects. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

AGRICULTURE AND SOIL CHEMISTRY CSU/UC (d)

GRAD CREDIT: Physical Science 10th -12th grade

This course explores the physical and chemical nature of soil as well as the relationships between soil, plants, animals and agricultural practices. Using knowledge of scientific protocols as well as course content, students will develop an Agriscience research project to be conducted throughout the first semester of the course. Additionally, students will develop a soil management plan for agricultural producers, using the content learned throughout the course. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Prerequisite: Successful completion of Ag Biology or instructor approval.

AGRICULTURE SYSTEMS MANAGEMENT CSU/UC (d)

GRAD CREDIT: Physical Science 11th-12th grade

Agriculture Systems Management combines an interdisciplinary approach to laboratory science and research with agricultural management principles. Using skills and principles learned in the course, students design systems and experiments to solve agricultural management issues currently facing the industry. Additionally, students will connect the products created in this class with industry activities to link real world encounters and implement skills demanded by both colleges and careers. The course culminates with an agriscience experimental research project in which students design and conduct an experiment to solve a relevant issue. Final projects will be eligible for Career Development Event competition at FFA events. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

FOOD SCIENCE CSU/UC (g) GRAD CREDIT: Elective 11th-12th grade

Students taking this course will experience a comprehensive study in foods. Students will learn about foods from origin through consumption, as well as processes involved between. Hands on experiences in the food system, through extensive engagement of community members and utilization of community resources will integrate course content directly as applied. Units in this course include an Overview of Food Science, Nutrition and Digestion, Chemistry of Foods, Operations in Food Processing, Packaging; Dairy Processing, Meat Poultry and Eggs, Cereal Grains, Legumes, and Oilseed, Fruits and Vegetables, Food Safety, Regulation and Labeling, Fats and Oils, Candy and Confectionery. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

P INTRO TO PLANT AND ANIMAL AGRICULTURE CSU/UC (g)

GRAD CREDIT: Elective 9th -12th grade

The Introduction to Plant and Animal Agriculture course is an entry level course which will introduce students to many aspects of agriculture. Topics of instruction include agricultural awareness and literacy, leadership and FFA, employability skills and introduction to all aspects of the total agricultural industry including California agriculture, plant science, and animal science. The class will include multiple hands on labs working with plants and livestock animals. Supervised agricultural experience programs and FFA leadership activities are integral components of the course and provide many opportunities for practical application of instructional competencies. Due to the co-curricular nature of FFA and SAE (Supervised

Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

P ANIMAL SCIENCE CSU/UC (g) GRAD CREDIT: Elective 10th –12th grade

This advanced course in Animal Science will focus on livestock management practices. Included in this course will be livestock breeds, health care, handling facilities, anatomy and physiology, artificial insemination and breeding practices, judging and many other hands-on activities. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Prerequisite: Completion of Intro to Plant and Animal Agriculture or instructor approval.

P VETERINARY SCIENCE CSU/UC (g) GRAD CREDIT: Elective 11th –12th grade

This course provides a basic overview of the veterinary field covering career skills, career opportunities, sanitation, various species of small animals, anatomy and physiology, nutrition, disease control, lab skills, pharmacology, emergency procedures, radiology, and common surgery procedures. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Prerequisite: Completion of Animal Science or instructor approval.

INTRO TO AG MECHANICS GRAD CREDIT: Elective 9th –12th grade

This course is designed to provide students with basic skills and knowledge in the areas of shop safety, ropework, cold metal, plumbing, electrical, wood working, and welding. Students will receive classroom instruction as well as “hands on” experience. Each unit of instruction includes a required project that is designed to allow the student to apply those skills learned in the classroom to a practical application and will be shown at the Stanislaus County Fair. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

INTRO TO POWER MECHANICS GRAD CREDIT: Elective 10th –12th grade

This introductory course will focus on small engines. The subjects that will be covered are internal combustion, electrical systems, fuel and fuel systems, hydraulics, maintenance and repair. The class will emphasize hands- on experience. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

AG WELDING GRAD CREDIT: Elective 10th –12th grade Students will learn how to arc weld, oxy-acetylene weld, cut, braze, and MIG (wire feed) weld. Students will get experience in basic project construction. All completed projects will be shown at the Stanislaus County Fair in Turlock. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

Prerequisite: Successful Completion of Intro to Ag Mechanics, or Instructor Approval.

ROP POWER MECHANICS GRAD CREDIT: Elective 11th –12th grade

This is a project-based course where students will learn the fundamentals of operations and engine diagnostics. Students will perform engine assembly and disassembly. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Prerequisite: Successful Completion of Intro to Power Mechanics, or instructor approval.

ROP WELDING GRAD CREDIT: Elective 11th –12th grade

This two period course is for the development of advanced welding skills. Students learn advanced skills in arc welding, MIG (wire feed), oxyacetylene welding and cutting, plasma cutting, and TIG (Tungsten and Inert Gas welding). Students will further develop job-related skills by becoming self-starters and acquiring necessary materials for projects, while developing safety and fire prevention attitudes. Students will earn college credits at Modesto Junior College if they complete the class and enroll at MJC. They will be prepared for a job in a welding shop. All completed projects will be shown at the Stanislaus County Fair. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

ROP WELDING FABRICATION II GRAD CREDIT: Elective 12th grade

This two period course, Welding & Fabrication provides serious students with entry-level skills at the completion of the course. Instruction is provided in advanced Shielded Metal and Gas Metal Arc Welding (M.I.G.) and advanced Oxy-Acetylene Welding. Gas Tungsten Arc Welding (T.I.G.) is also covered. Students are required to develop skills in welding overhead and completing welding certification tests, along with refining skills in operating the Air Carbon Arc, Plasma Arc, and Oxy-Acetylene cutting units. Students receive instruction in safety, hand and power tool usage, planning, and material selection and usage as related to the construction of items used around the shop and home. Students experiment with their own ideas and methods in the design and fabrication of an individual project. Students are allowed one semester to complete this task. If taken a second year, students are able to work on more complex projects that are more intense in design and fabrication. Students are encouraged to exhibit their projects at the local county fair and the California State Fair. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Prerequisite: Course: ROP Ag Welding.

INTRODUCTION TO PLANT PRODUCTION

GRAD CREDIT: Elective 10th –12th grade

This class will focus on how to grow and care for houseplants and plants used for landscaping. Students will learn how to reproduce plants, provide fertilizer, pest control, marketing and operate a greenhouse through hands-on experience. If you like plants, this is the class for you. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

ROP PLANT PRODUCTION GRAD CREDIT: Elective 11th –12th grade

This two-period course deals with landscape design, installation and maintenance. Topics of study include: landscape design, study of color, location of lawns, trees, shrubs, walks, driveways, patios, planters, and other landscape structures for home and parks. A great deal of the class consists of hands-on-activities. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

ROP INTRO TO FLORICULTURE GRAD CREDIT: Elective 9th-12th grade

This course is designed for students who are interested in the art of floral design. This course will cover flower care and processing, tool identification, flower ID, basic flower arranging, corsage construction, balloon design, and house plant care. The class will do seasonal projects with fresh flowers and dry materials. This class will prepare students for Ag Floriculture (ROP). Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. (This is a 2+2 class that is articulated with MJC)

P ROP AG ADV FLORICULTURE CSU/UC (f)

GRAD CREDIT: Fine Art or Elective 11th –12th grade

The Advanced Ag Floriculture ROP course will give students career experience in floral design and the artistic principles of visual art. Students will create floral arrangements using advanced design principles. Part of the class will be designing and arranging for outside floral sales such as weddings and events. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. (This is a 2+2 class that is articulated with MJC)

AG LEADERSHIP GRAD CREDIT: Elective 9th-12th grade

This course is designed to promote and develop leadership in the Agriculture Industry. Topics will include current issues in Ag, Ag legislation, development of personal leadership skills, FFA operation and Judging Teams and exploration of past and present needs in the Ag Industry and its leaders. This course will be offered during 0 period. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

# E. Program and/or Course Subject Matter Content Outline

## Program and/or Subject Matter Contents Outline

SUSTAINABLE AG BIOLOGY CSU/UC (d)

GRAD CREDIT: Life Science 9th –12th grade

Sustainable Agriculture Biology is a one year course designed to integrate biological science practices and knowledge into the practice of sustainable agriculture. The course is organized into four major sections, or units, each with a guiding question. Unit one addresses the question, What is sustainable agriculture? Unit two, sustainable agriculture fit into our environment? Unit three, What molecular biology principles guide sustainable agriculture? Unit four, How do we make decisions to maximize sustainable agricultural practices within a functioning ecosystem? Within each unit specific life science principles will be identified with agricultural principles and practices guiding the acquisition of this knowledge, culminating in the development of a sustainable farm model and portfolio of supporting student research. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Prerequisite: Math I enrollment.

P ADVANCED AG BIOLOGY CSU/UC (d) GRAD CREDIT: Life Science 9th –12th grade

This accelerated rigorous course is designed for Honors/Gate agriculture students who are college-bound. This course involves in-depth study of cellular organization and processes, reproduction of plants and animals, genetics, evolution, physiology of agriculture plant and animals and ecology. Emphasis will be placed on investigation, analysis, and critical thinking of course contents through labs and agriculture research projects. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

AGRICULTURE AND SOIL CHEMISTRY CSU/UC (d)

GRAD CREDIT: Physical Science 10th -12th grade

This course explores the physical and chemical nature of soil as well as the relationships between soil, plants, animals and agricultural practices. Using knowledge of scientific protocols as well as course content, students will develop an Agriscience research project to be conducted throughout the first semester of the course. Additionally, students will develop a soil management plan for agricultural producers, using the content learned throughout the course. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Prerequisite: Successful completion of Ag Biology or instructor approval.

AGRICULTURE SYSTEMS MANAGEMENT CSU/UC (d)

GRAD CREDIT: Physical Science 11th-12th grade

Agriculture Systems Management combines an interdisciplinary approach to laboratory science and research with agricultural management principles. Using skills and principles learned in the course, students design systems and experiments to solve agricultural management issues currently facing the industry. Additionally, students will connect the products created in this class with industry activities to link real world encounters and implement skills demanded by both colleges and careers. The course culminates with an agriscience experimental research project in which students design and conduct an experiment to solve a relevant issue. Final projects will be eligible for Career Development Event competition at FFA events. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

FOOD SCIENCE CSU/UC (g) GRAD CREDIT: Elective 11th-12th grade

Students taking this course will experience a comprehensive study in foods. Students will learn about foods from origin through consumption, as well as processes involved between. Hands on experiences in the food system, through extensive engagement of community members and utilization of community resources will integrate course content directly as applied. Units in this course include an Overview of Food Science, Nutrition and Digestion, Chemistry of Foods, Operations in Food Processing, Packaging; Dairy Processing, Meat Poultry and Eggs, Cereal Grains, Legumes, and Oilseed, Fruits and Vegetables, Food Safety, Regulation and Labeling, Fats and Oils, Candy and Confectionery. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

P INTRO TO PLANT AND ANIMAL AGRICULTURE CSU/UC (g)

GRAD CREDIT: Elective 9th -12th grade

The Introduction to Plant and Animal Agriculture course is an entry level course which will introduce students to many aspects of agriculture. Topics of instruction include agricultural awareness and literacy, leadership and FFA, employability skills and introduction to all aspects of the total agricultural industry including California agriculture, plant science, and animal science. The class will include multiple hands on labs working with plants and livestock animals. Supervised agricultural experience programs and FFA leadership activities are integral components of the course and provide many opportunities for practical application of instructional competencies. Due to the co-curricular nature of FFA and SAE (Supervised

Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

P ANIMAL SCIENCE CSU/UC (g) GRAD CREDIT: Elective 10th –12th grade

This advanced course in Animal Science will focus on livestock management practices. Included in this course will be livestock breeds, health care, handling facilities, anatomy and physiology, artificial insemination and breeding practices, judging and many other hands-on activities. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Prerequisite: Completion of Intro to Plant and Animal Agriculture or instructor approval.

P VETERINARY SCIENCE CSU/UC (g) GRAD CREDIT: Elective 11th –12th grade

This course provides a basic overview of the veterinary field covering career skills, career opportunities, sanitation, various species of small animals, anatomy and physiology, nutrition, disease control, lab skills, pharmacology, emergency procedures, radiology, and common surgery procedures. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Prerequisite: Completion of Animal Science or instructor approval.

INTRO TO AG MECHANICS GRAD CREDIT: Elective 9th –12th grade

This course is designed to provide students with basic skills and knowledge in the areas of shop safety, ropework, cold metal, plumbing, electrical, wood working, and welding. Students will receive classroom instruction as well as “hands on” experience. Each unit of instruction includes a required project that is designed to allow the student to apply those skills learned in the classroom to a practical application and will be shown at the Stanislaus County Fair. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

INTRO TO POWER MECHANICS GRAD CREDIT: Elective 10th –12th grade

This introductory course will focus on small engines. The subjects that will be covered are internal combustion, electrical systems, fuel and fuel systems, hydraulics, maintenance and repair. The class will emphasize hands- on experience. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

AG WELDING GRAD CREDIT: Elective 10th –12th grade Students will learn how to arc weld, oxy-acetylene weld, cut, braze, and MIG (wire feed) weld. Students will get experience in basic project construction. All completed projects will be shown at the Stanislaus County Fair in Turlock. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

Prerequisite: Successful Completion of Intro to Ag Mechanics, or Instructor Approval.

ROP POWER MECHANICS GRAD CREDIT: Elective 11th –12th grade

This is a project-based course where students will learn the fundamentals of operations and engine diagnostics. Students will perform engine assembly and disassembly. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Prerequisite: Successful Completion of Intro to Power Mechanics, or instructor approval.

ROP WELDING GRAD CREDIT: Elective 11th –12th grade

This two period course is for the development of advanced welding skills. Students learn advanced skills in arc welding, MIG (wire feed), oxyacetylene welding and cutting, plasma cutting, and TIG (Tungsten and Inert Gas welding). Students will further develop job-related skills by becoming self-starters and acquiring necessary materials for projects, while developing safety and fire prevention attitudes. Students will earn college credits at Modesto Junior College if they complete the class and enroll at MJC. They will be prepared for a job in a welding shop. All completed projects will be shown at the Stanislaus County Fair. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

ROP WELDING FABRICATION II GRAD CREDIT: Elective 12th grade

This two period course, Welding & Fabrication provides serious students with entry-level skills at the completion of the course. Instruction is provided in advanced Shielded Metal and Gas Metal Arc Welding (M.I.G.) and advanced Oxy-Acetylene Welding. Gas Tungsten Arc Welding (T.I.G.) is also covered. Students are required to develop skills in welding overhead and completing welding certification tests, along with refining skills in operating the Air Carbon Arc, Plasma Arc, and Oxy-Acetylene cutting units. Students receive instruction in safety, hand and power tool usage, planning, and material selection and usage as related to the construction of items used around the shop and home. Students experiment with their own ideas and methods in the design and fabrication of an individual project. Students are allowed one semester to complete this task. If taken a second year, students are able to work on more complex projects that are more intense in design and fabrication. Students are encouraged to exhibit their projects at the local county fair and the California State Fair. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. Prerequisite: Course: ROP Ag Welding.

INTRODUCTION TO PLANT PRODUCTION

GRAD CREDIT: Elective 10th –12th grade

This class will focus on how to grow and care for houseplants and plants used for landscaping. Students will learn how to reproduce plants, provide fertilizer, pest control, marketing and operate a greenhouse through hands-on experience. If you like plants, this is the class for you. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

ROP PLANT PRODUCTION GRAD CREDIT: Elective 11th –12th grade

This two-period course deals with landscape design, installation and maintenance. Topics of study include: landscape design, study of color, location of lawns, trees, shrubs, walks, driveways, patios, planters, and other landscape structures for home and parks. A great deal of the class consists of hands-on-activities. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

ROP INTRO TO FLORICULTURE GRAD CREDIT: Elective 9th-12th grade

This course is designed for students who are interested in the art of floral design. This course will cover flower care and processing, tool identification, flower ID, basic flower arranging, corsage construction, balloon design, and house plant care. The class will do seasonal projects with fresh flowers and dry materials. This class will prepare students for Ag Floriculture (ROP). Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. (This is a 2+2 class that is articulated with MJC)

P ROP AG ADV FLORICULTURE CSU/UC (f)

GRAD CREDIT: Fine Art or Elective 11th –12th grade

The Advanced Ag Floriculture ROP course will give students career experience in floral design and the artistic principles of visual art. Students will create floral arrangements using advanced design principles. Part of the class will be designing and arranging for outside floral sales such as weddings and events. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course. (This is a 2+2 class that is articulated with MJC)

AG LEADERSHIP GRAD CREDIT: Elective 9th-12th grade

This course is designed to promote and develop leadership in the Agriculture Industry. Topics will include current issues in Ag, Ag legislation, development of personal leadership skills, FFA operation and Judging Teams and exploration of past and present needs in the Ag Industry and its leaders. This course will be offered during 0 period. Due to the co-curricular nature of FFA and SAE (Supervised Agricultural Experience) students will be required to participate in both FFA activities and SAE involvement, both of which are graded components of the course.

## Course Expected Outcomes

Developed 2013-2014 school year. Do not reflect 2015-16 and 2016-2017 course changes.

### Ag Mechanics Pathway

**Intro to Ag Mechanics**

15. FFA and California Agriculture
16. Measurement
17. Tool ID
18. Shop safety/ procedures
19. Tie 8 knots and 3 splices
20. Sheet metal layout and fabrication
21. Pipe joints for steel, copper, and PVC and common fittings used
22. Fabrication of cold metal and fasteners used to join them
23. Wiring a basic circuit and principle of electricity
24. Wood layout and fabrication of wood joints
25. Basic plan reading
26. Basic bill of materials
27. Basic layout
28. Introduction to welding

**Intro to Ag Welding**

9. Demonstrate safe shop procedures and machinery operation.
10. Apply oxy-acetylene cutting theory to cut, pierce, and bevel steel.
11. Safely set-up and cut using the plasma arc machine.

12. Set-up, adjust, and weld correctly using SMAW in the flat and vertical positions using 6011,6013, and 7018 rods.
13. Set-up, adjust, and weld correctly using GMAW in the flat and vertical positions.
14. Properly layout and cut using CAD plans.
15. Fabricate a project that is structurally square and stable.
16. Create a bill of materials after project completion.

**ROP Welding**

6. Apply SMAW out of position using 6011 7018
7. Apply GMAW out of position
8. Set-up, adjust, and weld using TIG welding
9. Apply metal processing of oxy-acetylene and plasma to cut metal
10. Demonstrate project construction and structural design principles

**ROP Welding Fabrication**

2. Construct projects using SMAW, GMAW, TIG, and Oxy- Acetylene welding

## Power Mechanics Pathway

**Intro to Ag Mechanics**

14. FFA and California Agriculture
15. Measurement
16. Tool ID
17. Shop safety/ procedures
18. Tie 8 knots and 3 splices
19. Sheet metal layout and fabrication
20. Pipe joints for steel, copper, and PVC and common fittings used
21. Fabrication of cold metal and fasteners used to join them
22. Wiring a basic circuit and principle of electricity
23. Wood layout and fabrication of wood joints
24. Basic plan reading
25. Basic bill of materials
26. Basic layout

**Intro to Ag Welding**

9. Demonstrate safe shop procedures and machinery operation.
10. Apply oxy-acetylene cutting theory to cut, pierce, and bevel steel.
11. Safely set-up and cut using the plasma arc machine.
12. Set-up, adjust, and weld correctly using SMAW in the flat and vertical positions using 6011,6013, and 7018 rods.
13. Set-up, adjust, and weld correctly using GMAW in the flat and vertical positions.
14. Properly layout and cut using CAD plans.
15. Fabricate a project that is structurally square and stable.
16. Create a bill of materials after project completion.

**Intro to Power Mechanics**

10. Use Micrometers
11. 3 engine systems: ignition, carburetion, compression
12. Torque
13. Read technical writing

14. Basic parts ID
15. Use manual to look up part numbers
16. Basic tool ID
17. Basic cold metal fabrication
18. Basic engine overhaul

**ROP Power Mechanics**

9. Perform a complete engine overhaul
10. Look up part numbers using the mechanics manual
11. Complete work orders
12. Engine diagnostics and trouble shooting
13. Advanced tool ID
14. Basic part fabrication
15. Use diagnostic equipment
16. Use torch wrench

## Ornamental Horticulture

**Intro to Plant Production**

10. FFA and California Agriculture
11. Equipment safety
12. Plant propagation- sexual and asexual
13. Plant nutrition- macro and micro nutrients, organic and inorganic
14. Weed Control and identification- cultural and chemical
15. Pest Control and ID- organic and inorganic methods
16. Plant management- pruning, training, and harvest
17. Safe food handling- harvest, production, process, and storage
18. Disease control- prevention and treatment

**ROP Intro to Floriculture**

9. FFA and California Agriculture
10. Safe handling of floral sheers and knife
11. Identify 20 flowers, 20 potted plants, 20 tools
12. Construct a boutonnière
13. Construct a corsage
14. Construct a centerpiece arrangement
15. Complete a floral arrangement price sheet
16. Understand color concepts

**Advanced Plant Production**

9. Equipment operation- cultivate, bed preparation, mower, edger, blower
10. Apply Plant propagation- sexual and asexual
11. Apply Plant nutrition- macro and micro nutrients, organic and inorganic
12. Apply Weed Control and identification- cultural and chemical
13. Apply Pest Control and ID- organic and inorganic methods
14. Apply Plant management- pruning, training, and harvest
15. Apply Safe food handling- harvest, production, process, and storage
16. Apply Disease control- prevention and treatment

**ROP Ag Advanced Floriculture**

10. Safely handle tools

11. Identify all cut flowers, potted plants, and tools
12. Construct various artistic arrangements
13. Apply color concepts
14. Contemporary design styles and techniques
15. Complete retail and labor cost sheets
16. Peer and self analyze arrangements
17. Understand historical and cultural theory
18. Evaluate floral artwork

## Animal Science Pathway

**Intro to Animal Agriculture**

13. FFA and California Agriculture
14. Breeds- beef, sheep, swine, horse, chickens, dairy, dairy goats
15. Terminology
16. Digestive systems- ruminant, mono-gastric, and poultry
17. Grooming
18. Housing and equipment
19. Animal safety
20. Segments of the livestock industry
21. California agriculture and meats
22. Restraints
23. Animal identification
24. Basic external anatomy

**Animal Science**

10. Digestive systems and processes
11. Injection types- IM, IV, IR, Subcutaneous, intradermal
12. Animal Marketing- meat, mohair, wool, by products
13. Selection of animals
14. Showing
15. Basic animal husbandry
16. Nutrition and feeding
17. Reproduction and breeding
18. Genetics

**Vet Science**

9. Diseases of Livestock
10. Ethics and ethical treatment of public animals
11. Administration of medications
12. Medical examinations/ wound management
13. Fecal and urine samples
14. Anatomy and physiology
15. Animal behaviors
16. Surgical Instruments

## Agriculture Sciences

**Ag Chemistry**

10. Know the parts of the atom, its density, and how atoms are arranged on the periodic table

11. Know chemical bonding and how it applies to chemical reactions
12. Be able to balance chemical equations
13. Apply gas laws to specific situations
14. Understand principles of solutions and molarity for purposes of developing different concentrations
15. Apply acid and base knowledge to solutions for plant and animal health
16. Know nuclear chemistry and how matter affects it
17. Apply biochemistry to food production
18. Agriscience Fair emphasis on experimental design

**Ag Biology**

8. Cell organization and processes
9. Reproduction of plants and animals
10. Genetics
11. Evolution
12. Physiology of plants and animals
13. Ecology
14. Investigation and experimentation

**Advanced Ag Biology**

9. Agriscience Fair emphasis on experimental design
10. Cell organization and processes
11. Reproduction of plants and animals
12. Genetics
13. Evolution
14. Physiology of plants and animals
15. Ecology
16. Investigation and experimentation

# F. Program Completion Standards

## Program Completion Standards

Central Valley Ag Department program completer students who receive their state degree are awarded a graduation stole to wear during the graduation ceremony. We are one of only 3 organizations on campus that can award paraphernalia that students can wear during graduation.

## Course Expected Outcomes

Developed 2013-2014 school year. Do not reflect 2015-16 and 2016-2017 course changes.

## Ag Mechanics Pathway

**Intro to Ag Mechanics**

29. FFA and California Agriculture
30. Measurement
31. Tool ID
32. Shop safety/ procedures
33. Tie 8 knots and 3 splices
34. Sheet metal layout and fabrication
35. Pipe joints for steel, copper, and PVC and common fittings used
36. Fabrication of cold metal and fasteners used to join them
37. Wiring a basic circuit and principle of electricity
38. Wood layout and fabrication of wood joints
39. Basic plan reading
40. Basic bill of materials
41. Basic layout
42. Introduction to welding

**Intro to Ag Welding**

17. Demonstrate safe shop procedures and machinery operation.
18. Apply oxy-acetylene cutting theory to cut, pierce, and bevel steel.
19. Safely set-up and cut using the plasma arc machine.
20. Set-up, adjust, and weld correctly using SMAW in the flat and vertical positions using 6011,6013, and 7018 rods.
21. Set-up, adjust, and weld correctly using GMAW in the flat and vertical positions.
22. Properly layout and cut using CAD plans.
23. Fabricate a project that is structurally square and stable.
24. Create a bill of materials after project completion.

**ROP Welding**

11. Apply SMAW out of position using 6011 7018
12. Apply GMAW out of position
13. Set-up, adjust, and weld using TIG welding
14. Apply metal processing of oxy-acetylene and plasma to cut metal
15. Demonstrate project construction and structural design principles

**ROP Welding Fabrication**

3. Construct projects using SMAW, GMAW, TIG, and Oxy- Acetylene welding

## Power Mechanics Pathway

**Intro to Ag Mechanics**

27. FFA and California Agriculture
28. Measurement
29. Tool ID
30. Shop safety/ procedures
31. Tie 8 knots and 3 splices
32. Sheet metal layout and fabrication
33. Pipe joints for steel, copper, and PVC and common fittings used
34. Fabrication of cold metal and fasteners used to join them
35. Wiring a basic circuit and principle of electricity
36. Wood layout and fabrication of wood joints
37. Basic plan reading
38. Basic bill of materials
39. Basic layout

**Intro to Ag Welding**

17. Demonstrate safe shop procedures and machinery operation.
18. Apply oxy-acetylene cutting theory to cut, pierce, and bevel steel.
19. Safely set-up and cut using the plasma arc machine.
20. Set-up, adjust, and weld correctly using SMAW in the flat and vertical positions using 6011,6013, and 7018 rods.
21. Set-up, adjust, and weld correctly using GMAW in the flat and vertical positions.
22. Properly layout and cut using CAD plans.
23. Fabricate a project that is structurally square and stable.
24. Create a bill of materials after project completion.

**Intro to Power Mechanics**

19. Use Micrometers
20. 3 engine systems: ignition, carburetion, compression
21. Torque
22. Read technical writing
23. Basic parts ID
24. Use manual to look up part numbers
25. Basic tool ID
26. Basic cold metal fabrication
27. Basic engine overhaul

**ROP Power Mechanics**

17. Perform a complete engine overhaul
18. Look up part numbers using the mechanics manual
19. Complete work orders
20. Engine diagnostics and trouble shooting
21. Advanced tool ID
22. Basic part fabrication
23. Use diagnostic equipment
24. Use torch wrench

## <u>Ornamental Horticulture</u>

**Intro to Plant Production**

19. FFA and California Agriculture
20. Equipment safety
21. Plant propagation- sexual and asexual
22. Plant nutrition- macro and micro nutrients, organic and inorganic
23. Weed Control and identification- cultural and chemical
24. Pest Control and ID- organic and inorganic methods
25. Plant management- pruning, training, and harvest
26. Safe food handling- harvest, production, process, and storage
27. Disease control- prevention and treatment

**ROP Intro to Floriculture**

17. FFA and California Agriculture
18. Safe handling of floral sheers and knife
19. Identify 20 flowers, 20 potted plants, 20 tools
20. Construct a boutonnière
21. Construct a corsage
22. Construct a centerpiece arrangement
23. Complete a floral arrangement price sheet
24. Understand color concepts

**Advanced Plant Production**

17. Equipment operation- cultivate, bed preparation, mower, edger, blower
18. Apply Plant propagation- sexual and asexual
19. Apply Plant nutrition- macro and micro nutrients, organic and inorganic
20. Apply Weed Control and identification- cultural and chemical
21. Apply Pest Control and ID- organic and inorganic methods
22. Apply Plant management- pruning, training, and harvest
23. Apply Safe food handling- harvest, production, process, and storage
24. Apply Disease control- prevention and treatment

**ROP Ag Advanced Floriculture**

19. Safely handle tools
20. Identify all cut flowers, potted plants, and tools
21. Construct various artistic arrangements
22. Apply color concepts
23. Contemporary design styles and techniques
24. Complete retail and labor cost sheets
25. Peer and self analyze arrangements
26. Understand historical and cultural theory
27. Evaluate floral artwork

## <u>Animal Science Pathway</u>

**Intro to Animal Agriculture**

25. FFA and California Agriculture
26. Breeds- beef, sheep, swine, horse, chickens, dairy, dairy goats
27. Terminology
28. Digestive systems- ruminant, mono-gastric, and poultry
29. Grooming
30. Housing and equipment

31. Animal safety
32. Segments of the livestock industry
33. California agriculture and meats
34. Restraints
35. Animal identification
36. Basic external anatomy

**Animal Science**

19. Digestive systems and processes
20. Injection types- IM, IV, IR, Subcutaneous, intradermal
21. Animal Marketing- meat, mohair, wool, by products
22. Selection of animals
23. Showing
24. Basic animal husbandry
25. Nutrition and feeding
26. Reproduction and breeding
27. Genetics

**Vet Science**

17. Diseases of Livestock
18. Ethics and ethical treatment of public animals
19. Administration of medications
20. Medical examinations/ wound management
21. Fecal and urine samples
22. Anatomy and physiology
23. Animal behaviors
24. Surgical Instruments

## Agriculture Sciences

**Ag Chemistry**

19. Know the parts of the atom, its density, and how atoms are arranged on the periodic table
20. Know chemical bonding and how it applies to chemical reactions
21. Be able to balance chemical equations
22. Apply gas laws to specific situations
23. Understand principles of solutions and molarity for purposes of developing different concentrations
24. Apply acid and base knowledge to solutions for plant and animal health
25. Know nuclear chemistry and how matter affects it
26. Apply biochemistry to food production
27. Agriscience Fair emphasis on experimental design

**Ag Biology**

15. Cell organization and processes
16. Reproduction of plants and animals
17. Genetics
18. Evolution
19. Physiology of plants and animals
20. Ecology
21. Investigation and experimentation

**Advanced Ag Biology**

17. Agriscience Fair emphasis on experimental design
18. Cell organization and processes
19. Reproduction of plants and animals
20. Genetics
21. Evolution
22. Physiology of plants and animals
23. Ecology
24. Investigation and experimentation

# G. Description of Facilities and Major Equipment

## G. Description of Facilities and Major Equipment

Facilities

- 5 classrooms (2 connected to mechanics shop, 1 floral shop with storage, 1 lab classroom with private storage room, 1 lab classroom connected to shared chemical storage)
- 1 Ag Mech shop
- 1 Power Mech shop
- 2 sea train containers
- 2 30'x60' automated greenhouses (1 with mister table)
- 1 20'x30' hydroponics greenhouse
- 1 20'x30' Small Animal unit/ Rabbitry building
- 1 12'x12' stationary floral cooler

Shared Facilities

- 6.5 acre Ceres Ag Center Farm
- 3000 sq. ft. Vegetable Processing building
- 1.25 acre district livestock farm

Major Equipment

- 9 SMAW welders
- 9 MIG/ Fluxcore welders
- 2 TIG welders
- 3 drill presses
- 100 gallon air compressor
- table saw
- plasma cam
- CNC machine
- 2 10' refrigerated floral cases
- Breedn' Betsy AI simulator

Shared Equipment

- Ford 9 passenger van
- Ford ¾ Ton Pickup
- 16' Gooseneck Livestock trailer
- 12' bumper pull livestock trailer
- John Deere Tractor
- Kubota Tractor

- Bed Shaper
- Ripper
- Disc

# H. Five Year Facility and Equipment Acquisition Schedule

## Five Year Facility and Equipment Acquisition Schedule

15-16

- Breed'n Betsy
- Loader/ Ripper for tractor
- Color Printer (agriscience)

Poster Printer (Agriscience)
New Truck
Floor Brake
DiArco Bender
Power Slip Roll
Bar Folder
Cattle Chute and lead up
Cultivation tractor
Walk in refrigerator
Sprayer
Large mower attachment
Work benches
Storage cabinets
Anvils
Bench grinder
Building Swine Unit at Ag Center

16-17
Flatbed trailer
New Van
Pallet jack
Post hole digger
Dehydrators
Convection ovens
Meat grinder
Hot plates
Vacuum sealer

17-18
Building Ruminant Barn at Ag Center
Replace 8 arc welders
Replace 20 engines

18-19

- Replace siding in greenhouse
- Replace benches in greenhouses

19-20

- Free range chicken houses
- Apiary boxes

# I. Staff Assignments

## Staff Assignments

| | Ken | Jessi | Brian | Clarissa | Tony |
|---|---|---|---|---|---|
| Site Budget | X | | | | |
| ROP Budget | X | | | | |
| VEA Budget | X | | | | |
| Ag Incentive | X | | | | |
| FFA Budget | | | | | X |
| **Fair** | | | | | |
| Dairy | | | | | X |
| Beef | | | X | | |
| Ag Mechanics | | | | | X |
| Sheep | | X | | | |
| Swine | | | | X | |
| Rabbits | | | | | X |
| Poultry | X | | | | |
| Ag Hort | X | | | | |
| Horticulture | X | | | | |
| Horse | | X | | | |
| Goat | | X | | | |
| Floriculture | | | X | | |
| Landscapes | | X | | | |
| Power Mech | | | | | X |
| **Judging Teams** | | | | | |
| Floriculture | | | X | | |
| Small Engine | | | | | X |
| Dairy | | | | | X |
| Sectional BIG | | | | X | |
| FBM | | X | | | |
| Parli Pro | | | X | X | |
| Poultry | | | | X | |
| **FFA** | | | | | |
| Officers | | X | | X | |
| FFA President | | | | | |
| FFA Vice President | | | | | |
| FFA Secretary | | | | | |
| FFA Treasure | | | | | |
| FFA Sentinal | | | | | |
| FFA Historian | | | | | |
| FFA Reporter | | | | | |
| Point Award System | | | X | | |
| Chapter Meetings | | X | | X | |
| Officer Meetings | | X | | X | |
| Greenhand Officers | | | | X | |
| Officer Training | | X | | | |
| Ice Cream Social | | | X | | |
| Greenhand BBQ | X | | | | |
| Welcome Back BBQ | | | X | | X |
| Project Competition | | | | | X |
| Faculty Breakfast | X | | | | |
| ALA/MFE | | | | X | X |
| Fair Meeting | | | | | X |
| Impromptu | | | | | X |
| Recruitment | | X | | X | |

| | | | | | |
|---|---|---|---|---|---|
| Prepared Speaking | | X | | | |
| Extemp Speaking | | | | | X |
| COOP Quiz | | | X | | |
| Job Interview | | | | X | |
| Creed Speaking | | | | X | |
| Floral Sales | | | X | | |
| Occupational Oly | X | | X | | X |
| Caroling For Cans | | X | | | |
| Recycling Posters | X | | | | |
| Section Leadership Conf. | | X | | | X |
| State Conference | | | | X | X |
| Football BBQ | X | | | | |
| FFA Banquet | | X | | X | |
| Scholarship | X | | | | |
| Tree Sales | | | | | X |
| Greenhand Conf | | | | X | |
| COLC | | | | | X |
| Section Bowling | | | | | X |
| Section Volleyball | | | | | X |
| Opening/Closing | | X | | | |
| Halloween Fun Fair | | | X | | |
| National Convention | | | | | X |
| Food Court | X | | | | |
| **Plant Sale** | | | | | |
| Ag Mechanics | | | | | X |
| House Plants | | | X | | |
| Vegetables | X | | | | |
| Promotions | | | | X | |
| Students | | X | | | |
| **Department** | | | | | |
| R-2 | | X | | | |
| State Degree | | | X | X | |
| American Degree | | X | | | |
| Proficiency Awards | | X | | | |
| FFA Roster | | X | | | |
| Program of Work | | | X | | |
| Department Plan | | X | | | |
| Advisory Committee | X | | | | |
| **School Farm** | | | | | |
| Swine | | | | X | |
| Sheep | | X | | | |
| Goat | | X | | | |
| Cattle | | | X | | X |
| Greenhouses | X | | | | |
| Veg Crops | X | | | | |
| Hidahl | X | | | | |

# J. FFA Program of Activities

# Central Valley High School
# FFA

2015 – 2016

# Program of Activities

# Table of Contents

# Introduction

The FFA is a national organization for the students studying agriculture in public secondary schools under the provision of the National Vocational Education Acts.

An integral part of the program of education in agriculture in the public schools system of America, the FFA has become well-known in recent years. No national student organization enjoys greater freedom of self-government under adult council and guidance than the FFA. Organized in November 1928, it has served to motivate and vitalize the instruction offered to students of agriculture and to provide further training in citizenship and agricultural business.

The FFA is an intra-curricular activity having its origin and roots in a definite part of the school curriculum. Topics of discussion include how to construct and take an active part in public meetings, to speak effectively in public, to buy and sell cooperatively, to devise solutions for their own problems, to assume civic responsibilities, and to finance themselves. The foundation upon which the FFA organization is molded includes leadership, thrift, scholarship, improved agriculture, organized recreation, citizenship, and patriotism.

The FFA is a non-profit, non-political youth organization of voluntary membership, designed to take its place along with other agents striving for the development of leadership, the advancement of agricultural technology, and the improvement of life.

National headquarters for the FFA is located in the Agricultural Education Branch Office of Health, Education, and Welfare, Washington D.C. National Conventions are held annually in Louisville, Kentucky, and the California Association, with its headquarters in Sacramento.

The Central Region, one of six geographical regions of the California Association, encompasses Stanislaus, Merced, Mariposa, Mono, Tuolumne, San Joaquin, Calaveras, Yolo, Sacramento, El Dorado, and Amador Counties. The Region's annual conference is held during the month of November at a school located within the Region's boundaries.

In all levels of participation, students hold various offices and control the events of participation.

## President's Message

Dear FFA Members,

Central Valley FFA is excited for the upcoming year. This year, our main focus is reaching out to more FFA members in our school and members of our community. By increasing outreach on social media, we plan on increasing the amount of members participating in FFA events, competitions, and leadership events. We will utilize the effectiveness of Facebook, Instagram, print media, and word of mouth to inform and inspire more members about FFA Activities. These forms of media will allow us to not only reach out to FFA members, but also members of our community. We plan on having at least 2 major and influential community service events throughout the school year. With the community as our major supporter, we plan on dedicating more time and effort to our supporters.

Having a majority of the executive team being new members, we are excited for the new faces representing our chapter. Having a constitutional officer team and an executive committee, we will be able to accomplish much more this year. I am looking forward to another amazing year serving Central Valley FFA and I am proud to say that I am a part of this association.

Thank you for giving me this opportunity to be a servant leader to you,

Andrew Dias

Central Valley FFA President

# Officer's Page

## 2015-2016 Chapter FFA Executive Team

President: Andrew Dias-Senior

Treasurer: Emanuel Alvarez-Senior

Vice President: Gabriella Germann-Senior

Reporter: Alondra Gonzalez-Junior

Secretary: Brenda Diaz-Sophomore

Sentinel: Wilber Arellano-Sophomore

Promotion Committee: Emileigh Earn-Senior

Wrecking Crew: Victor Barajas-Senior

Food and Fundraising Committee: Bailey Rodriguez-Sophomore

# Officer Team Goals

6. Meet as a team more often than Tuesday
   - Socials, dinners, etc.
7. To disperse at events, to not be "cliquey"
   - Talk to fellow members
   - Make everyone feel welcome
8. To disperse responsibilities evenly throughout officers.
   - Ensure that not only a few amount of officers are loaded down with responsibilities, but that everyone has even responsibilities.
9. Be tolerant and supportive of each team member.
   - Be nice to one another, no arguing
   - Be open to new ideas
10. Have productive officer meetings.
    - Arrive early
    - Stay focused
    - Accomplish goals for meeting

# 2015-2016 Chapter Goals

This year's officer team picked five goals to focus on for the upcoming school year at their officer retreat held in Twain Hart in July.

5. **Increase Community Service Involvement**
   a. Canned Christmas Tree Drive
   b. Diamond Bar Arena
6. **Increase Member Involvement**
   a. Be Fun with a variety of activities
   b. Be Relatable
   c. Advertising Meetings through social media, and videos
   d. Bulletin Board Updates
   e. Snacks/Incentives at Meetings
   f. Monthly Recognition in bulletin/newspaper
   g. 8th Grade Recruitment
   h. Greenhand Committee
   i. FFA Spirit Days
7. **Increase Agriculture Literacy**
   a. Ceres Agriculture Clinics
   b. Farm Visits/Days
   c. Did you know? In bulletin/announcements
   d. Social Media
   e. Fair Booth
8. **Increase Team Building/Bonding**
   a. Monthly Dinners
   b. Coco Moo
   c. Mid-Year Officer Retreat
   d. E-mail communications

# Calendar of Activities

**August**

| | |
|---|---|
| 5 | Stanislaus Farm Supply Farm to Fork Dinner |
| 8 | Farm Supply Picnic |
| 14 | Ice Cream Social |
| 19 | Welcome Back BBQ |
| 29 | Central Region SOLS |
| 28 | Football BBQ @CHS |

**September**

| | |
|---|---|
| 4 | Football BBQ @CHS |
| 9 | FFA Meeting Burrito Bingo |
| 22 | Greenhand Leadership Conference |
| 25 | Football BBQ @ CHS |

**October**

| | |
|---|---|
| 3-4 | Central Region COLC |
| 3-4 | Pumpkin Patch sales |
| 6 | Oakdale Opening & closing Invitational |
| 7 | FFA Meeting @ 3;15 |
| 10-11 | Pumpkin Patch sales |
| 14 | Tri Rivers Opening & Closing |
| 17 | Parli Pro Comp |
| 17-18 | Pumpkin Patch Sales |
| 23 | Football BBQ @ CHS |
| 24-25 | Pumpkin Patch Sales |
| 26-31 | National FFA Convention |
| 28 | FFA Bonfire @ CHS |
| 30 | Football BBQ @ CHS |
| 31 | Pumpkin Patch sale |

**November**

| | |
|---|---|
| 16 | Drive Thru BBQ sales begin |
| 16 | Fruit Tree Sales Begin |
| 17 | Pin Maker and Signature Sheet @ Lunch |
| 18 | FFA Degree Ceremony @ 6:30 |
| 20 | Central Region CATA |
| 20 | UC Davis |

**December**

| | |
|---|---|
| 1 | Sectional Region Activity |
| 2 | FFA Activity (Cookie decorating & contest) |
| 4 ` | BBQ forms due |
| 4 | Fruit trees forms due |
| 9 | Drive thru BBQ 4-6 pm |

14 Fruit trees arrive
17 Exec Team Potluck
17 Winter Retreat

**January**
13 FFA Meeting (Minute to Win it )
20 State Degree Scoring @ Gregori
28 Super Thursday @ Pitman

**February**
6 Arbuckle Field Day
6 MJC Parli Pro Invitational
10 Regional Prelims @ Galt
12 Regional speaking Finals
17 Fair Exhibitor & Parent meeting @ 6:30
19-20 MFE/ ALA in Modesto & Regional Officer Interview
21-27 National FFA Week
22 Sport Day LTA: Strongman
23 Staff Breakfast
23 Professional Dress Day: LTA Grass Ski & Dancing
24 Hero Day: Minute to Win it
25 Western Day: LTA: FFA member Lunch
26 CVHS/FFA Spirit Day:LTA: Tractor Pull
27 Central Region CATA/FFA Meeting

**March**
4 UC Davis Parli Pro
5 UC Davis Field Day
12 Chico state field day
16 FFA Meeting Dodge ball @ 3;15
19 Merced Field Day
21 State Degree Ceremony in Turlock
24 Occupational Olympics
26 Modesto Field Day

**April**
1 Regional Parli Pro
6 FFA Bonfire @ 6;30
8 FFA Plant Sale 3-6
9 FFA Plant Sale 8-2
10 FFA Plant sale 8-12
12 Sectional Activity TBD
13 FFA Meeting Elections @3;15
23 Fresno Field Day
23-26 State FFA Convention

**May**

| | |
|---|---|
| 7 | State Finals @ Cal Poly SLO |
| 13 | FFA Banquet @ 6 Pm |
| 18 | American Degree Scoring @ Turlock |
| 20 | Drive Thru BBQ Orders Due |
| 20-22 | Camp Sylvester |
| 21 | Ceres Ag Boosters Dinner Fundraiser |
| 25 | Drive Thru BBQ 4-6 |

**July**

| | |
|---|---|
| 13-23 | Stanislaus County Fair |

# *The National FFA Organization*

**Central Valley FFA** **209-556-1900**
**1440 Central Ave.**
**Ceres, CA 95307**

Central Valley FFA
2015-2016 Budget

| Fund Raisers: Expenses: | Income: | |
|---|---|---|
| 8. Football BBQ Concessions | $2100 | $1200 |
| 9. Fruit Tree Sale | $2500 | $1300 |
| 10. Drive Through BBQ | $1600 | $800 |
| 11. Plant Sale | $1850 | $500 |
| 12. Catering | $2000 | $1000 |
| 13. Graduation Plant Sale | $1850 | $450 |
| 14. T-Shirt Sale | $100 | $100 |
| | | Total $6900 |

| Expenses Income | Expense | |
|---|---|---|
| 9. Conferences | $6000 | $4200 |
| 10. Fundraiser Food & Supplies | $8400 | $11500 |
| 11. Contests | $3000 | $400 |
| 12. Floral Supply | $4800 | $4800 |
| 13. Fair | $9300 | $8725 |
| 14. Meeting Supplies | $1000 | $0 |
| 15. Banquet | $1000 | $250 |
| 16. Misc. | $3500 | $7175 |

Total -$6725

Net $175

# American Degree Recipients

The FFA American Degree is awarded to members who have demonstrated the highest level of commitment to FFA and made significant accomplishments in their supervised agriculture experiences (SAEs)

2012
Cherise Azevedo - Diversified Agriculture

2013
Alexis Ulloa - Sheep Production

2014
Dominique Germann - Dairy Placement
Luis Alvarez - Sheep Production
William Bailey - Swine Production

# State Degree Recipients

The State FFA Degree is given to the top members of a State FFA Association, to receive a State FFA Degree members must meet the requirements listed in the Official FFA Manual.

2011
Katie Gaede
Katy Butrica?

2012
Luis Alvarez
Wynter Bratenas
Dominique Germann
Alexis Ulloa

2013
Ernesto Cuevas
Marlen Diaz

2014
Vincent Avila
Kyle Bates
Samantha Castellanos
Raul Gontiz
Carina Partida
Alana Ramos
Maricela Yepez

2015
Emanuel Alvarez
Andrew Dias
Gabriella Germann

# FFA and Agricultural Education

When you put on an FFA jacket, you become part of a total agriculture education program that will connect you to exciting careers in the science, business and technology of agriculture. FFA is only one of three essential components of this system, all of which work together to provide you with the personal, academic and career experiences essential for your success. Get to know the "three circles" that make this possible.

**Classroom/Laboratory Instruction-** Agriculture is rooted in science, math, business and technology. The time you spend in the classroom and school lad with you teacher will help you explore and master the information necessary to move forward with you career development. Get ready for exciting hands-on opportunities that make textbooks come alive!

**Supervised Agricultural Experience (SAE)-** Nothing takes your skills to highest level faster than putting them into practice. Through an SAE, you can create your own landscaping business, conduct a scientific research project that could change the world, grow crops or raise livestock, secure a meaningful job that provides insider experience related to your career choice, or learn how to make a difference in your community though civic engagement. Best of all, you can earn while you learn.

**FFA-** As an FFA member, you'll work on developing your potential for premier leadership, personal growth and career success. By participating in competitions, degree programs, state and national conventions, community service projects, summer camps and chapter committees, you'll grow in ways that take advantage of your talents and help you become the leader you were meant to be. The key to success in FFA is to get involved!

Make sure you're getting a complete Agricultural Education experience, and remember that it all works together. Talk with you agricultural teacher today and make plans to perform in all three arenas. Don't just settle for a high school diploma when you can get set for life.

# FFA Mission and Strategies


FFA makes a positive difference in the lives of students by developing their potential for **premier leadership, personal growth and career success through agriculture education**.

To accomplish this mission, FFA:

- Develops competent and assertive agriculture leadership
- Increases awareness of the global and technological importance of agriculture and its contribution to our well-being.
- Strengthens the confidence of agriculture students in themselves and their work.
- Promotes the intelligent choice and establishment of an agricultural career
- Encourages achievement in supervised agricultural experience programs
- Encourages wise management of economic, environmental and human resources of the community
- Develops interpersonal skills in teamwork, communications, human relations and social interaction.
- Builds character and promotes citizenship, volunteerism and patriotism.
- Promotes cooperation and cooperative attitudes among all people.
- Promotes healthy lifestyles.
- Encourages excellence in scholarship.

# FFA Emblem

Many organizations have logos they use as part of their identity. As with most logos, the FFA emblem is symbolic. It contains five separate elements. Each element represents items or ideals that are important to the organization and its members.

**The cross-section of an ear of corn** serves as the emblem's foundation, just as corn has historically served as a foundation crop in American agriculture. Corn is also a symbol of unity because it is native to America and it is grown in every state.

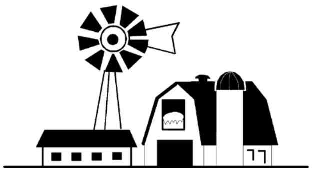
**The rising sun** appears in the center of the emblem and symbolizes progress in agriculture and the confidence FFA members have in the future.

**The plow** is a symbol of labor and tillage of the soil.

**The owl** represents knowledge and wisdom.

**The eagle** is perched on top of the emblem and served as a reminder of our freedom and ability to explore new horizons for the future of agriculture.

Finally, the words, **"Agriculture Education"** surrounding the letters "FFA" indicate that the FFA is an important part of the agricultural education program.



# FFA Creed

The FFA Creed is a basic statement of beliefs and a common bond between members. The creed was written by E.M. Tiffany and adopted at the 3rd National FFA Convention. It was revised at the 38th and 63rd conventions to reflect changes in FFA members and the agricultural industry.

## The FFA Creed

*I believe in the future of agriculture, with a faith born not of words but of deeds - achievements won by the present and past generations of agriculturists; in the promise of better days through better ways, even as the better things we now enjoy have come to us from the struggles of former years.*

*I believe that to live and work on a good farm, or to be engaged in other agricultural pursuits, is pleasant as well as challenging; for I know the joys and discomforts of agricultural life and hold an inborn fondness for those associations which, even in hours of discouragement, I cannot deny.*

*I believe in leadership from ourselves and respect from others. I believe in my own ability to work efficiently and think clearly, with such knowledge and skill as I can secure, and in the ability of progressive agriculturists to serve our own and the public interest in producing and marketing the product of our toil.*

*I believe in less dependence on begging and more power in bargaining; in the life abundant and enough honest wealth to help make it so--for others as well as myself; in less need for charity and more of it when needed; in being happy myself and playing square with those whose happiness depends upon me.*

*I believe that American agriculture can and will hold true to the best traditions of our national life and that I can exert an influence in my home and community which will stand solid for my part in that inspiring task.*

# FFA Colors and Motto

## Colors

The National FFA Organization chose national blue and corn gold as its official colors in 1929. As the blue field of our nation’s flag and the golden fields of ripened corn unify our country, the FFA colors give unity to the organization.

## Motto

Many important things come in small containers. Although a diamond ring takes up a little space, it is extremely valuable. So it is with the FFA motto. The motto has just 12 words, but those words are powerful.

LEARNING TO DO,

DOING TO LEARN,

EARNING TO LIVE,

LIVING TO SERVE

# FFA Official Dress

One of the most unifying elements for any group is its uniform. In FFA, the uniform members wear to local, state and national functions is called official dress. It provides identity and gives the organization a distinctive and recognizable image.

## Proper Use of the FFA Jacket

- The jacket is to be worn only by members.
- The jacket should be kept clean and neat at all times.
- The back of the jacket includes only: a large official FFA emblem, the name of the state association and the name of the local chapter, district or area. The front of the jacket includes only: a small official FFA emblem, the name of the individual, one office or honor and the year of that office or honor.
- The jacket should be worn on official occasions with the zipper fastened to the top. The collar should be turned down and the cuffs buttoned.
- The jacket should be worn by members and officers on all official FFA occasions, as well as other occasions where the chapter or state association is represented. It may be worn to school and other appropriate places.
- The jacket should only be worn to places that are appropriate for members to visit.
- School letters and insignia should not be attached to or worn on the jacket.
- When the jacket becomes too faded and worn to wear in public, it should be discarded or the emblems and lettering should be removed.
- The emblems and lettering should be removed if the jacket is given or sold to a non-member.
- A member should act professionally when wearing the official FFA jacket.
- Members should refrain from use of tobacco and alcohol when underage and at all times when representing the FFA. In addition, members should exhibit their leadership qualities when they encounter substances including tobacco and alcohol and serve to discourage others from inappropriate behavior.
- All chapter degree, officer pins, and other award medals should be worn beneath the name on the right side of the jacket, with the exception that a single State FFA charm and American FFA key should be worn above the name or attached to a standard key chain. No more than three medals should be worn on the jacket; these should represent the highest degree earned, the highest office held and the highest award earned by the member.

## Official FFA Dress

- Official dress for female members is a black skirt, white blouse with blouse with official FFA scarf, black shoes, and official jacket zipped to the top. Black slacks may be worn for traveling and outdoor activities.
- The official dress for male members is black slacks, white shirt, official FFA tie, black shoes, black socks and the official jacket zipped to the top.

# FFA Code of Ethics

People are always observing you. Your actions when you wear the FFA jacket or represent the organization become part of the organization's image. To keep the image of the FFA and members sharp, delegates at the 1952 National FFA Convention adopted a Code of Ethics for FFA members to follow. The FFA Code of Ethics still protects the FFA image. It also guides members to make positive, healthy choices – and not only during FFA activities. The code of ethics guidelines are good to follow during all occasions and functions.

## The FFA Code of Ethics

FFA Members conduct themselves at all times to be a credit to their organization, chapter, school, community and family. I pledge to:

- Develop my potential for premier leadership, personal growth and career success
- Make a positive difference in the lives of others.
- Dress neatly and appropriately for the occasion.
- Respect the rights of others and their property.
- Be courteous, honest and fair with others.
- Communicate in an appropriate, purposeful and positive manner.
- Demonstrate good sportsmanship be being modest and winning and generous in defeat.
- Make myself aware of FFA programs and activities and be an active participant.
- Conduct and value a supervised agricultural experience program.
- Strive to establish and enhance my skills through agricultural education in order to enter a successful career.
- Appreciate and promote diversity in our organization.

# Leadership Conferences

### Greenhand Conference

The Greenhand Conference is designed for freshman FFA members. Students will learn about the FFA organization and benefits of being a member. They will develop an individual personal plan for success and learn about careers in agriculture. This is a one day conference.

### Camp Sylvester

This leadership retreat is designed for current chapter officers and committee chairs. Students will participate in trust and team building activities. Students who attend will return to the chapter with new skills to promote the chapter and be ready to encourage members to get involved. This is a three day conference.

### Chapter Officer Leadership Conference (COLC)

COLC is designed for the current Chapter Officers. During this conference students will learn officer skills, team management, plan meeting activities and speaking skills. This is a two day conference.

### Made for Excellence (MFE)

MFE is designed for sophomore and junior FFA members. The theme of the conference is personal growth. Participants focus on their talents, skills and willpower. Students who attend the conference will gain a level of confidence and competence that will enable them to positively influence peers and generate a new level of excitement. This is a two day conference.

### Advanced Leadership Academy (ALA)

ALD is intended to produce young leaders who will return to the chapter motivated an well-prepared for solving problems and identifying growth opportunities. During this conference, ALD participants discuss issues such as recruiting new FFA members, fundraising, creating public awareness for FFA and improving chapter meetings. This is a two day conference designed for Juniors and Seniors.

### Washington Leadership Conference (WLC)

WLC provides the ultimate leadership experience for members of the National FFA Organization. This program is designed for those members who are ready to take their leadership skills to a higher level. Located in our nation's capitol, WLC host seven, one-week conferences over the course of the summer.

### Sacramento Leadership Experience

This conference is designed for Seniors. Students will learn about government operations, Agricultural industry, organization management and critical thinking. This is a three day conference, students must apply and be selected by the State FFA.

### State Convention

The state FFA convention is the highlight of a year's activity by FFA members. Delegates from each chapter conduct business of the state association and elect officers to represent them during the coming year. This is a four day conference held in April.

**National Convention**

The national FFA convention is similar in purpose to a state FFA convention, but is held on a much larger scale. It is now the larges annual meeting of students in the nation, with an attendance of over 50,000 members.

# S.A.E.

What if you could get classroom credit and FFA awards for doing what you like: experimenting with careers, earning money, building a resume and having fun? You can – with a Supervised Agricultural Experience (SAE) program. An SAE is a program you design to gain hands-on experience and develop skills in agricultural career areas that interest you.

You choose an SAE program that lets you discover, explore, experience and excel in careers. In the meantime, you gain skills and experience that pay off in areas of life. Your SAE program can lead you toward personal growth, premier leadership, and career success.

An SAE program is not just another class assignment or graduation requirement. You are truly in charge of your SAE! Although your agriculture teacher will help you learn related information and keep good records, the success or failure of your SAE is up to you. It's an exciting opportunity to prove your abilities to future employers – and to yourself.

## Central Valley FFA SAE Program

The Chapter will encourage all members to maintain a Supervised Agriculture Experience (SAE) program.

Members are encouraged to apply for local, regional and state proficiency awards.

Members are encouraged to apply for advanced degrees (i.e. State FFA Degree)

Members are encouraged to compete in the Local and Sectional Project Competition.

Members are encouraged to strive to improve and develop their SAE each year.

Encourage members to develop skills within their SAE through participation and appropriate judging teams.

Members are encouraged to provide support and help their fellow Chapter members.

# Market Hog Project Budget

## Estimated Expenses

| | |
|---|---|
| Cost of hog | $275.00 |
| Feed | 245.00 |
| Livestock Insurance | 25.00 |
| Fair Entry | 35.00 |
| Show Supplies/Shavings | 60.00 |
| Total Estimated Expenses | 640.00 |

## Estimated Receipts

| | |
|---|---|
| Sale of hog (240 lbs. @ $3.00/lb) | $720.00 ©  |
| **Total Estimated Receipts** | $720.00 |
| **Total Estimated Expenses** | - 640.00 |
| **Estimated Net Profit** | $80.00 |

# Market Lamb Project Plan Sheet

## Market Lamb Project Budget

**Estimated Expenses**

| | |
|---|---|
| Cost of Lamb | $300.00 |
| Feed (grain and hay) | 150.00 |
| Livestock Insurance | 15.00 |
| Fair Liability Insurance | 35.00 |
| Show Supplies | + 20.00 |
| Total Estimated Expenses | $500.00 |

**Estimated Receipts**

| | |
|---|---|
| Sale of Lamb (135 lbs. @ $4.00/lb) = | $540.00 ©️ |
| **Total Estimated Receipts** | $540.00 |
| **Total Estimated Expenses** | - 500.00 |
| **Estimated Net Profit** | $40.00 |

# Market Goat Project Plan Sheet

## Market Goat Project Budget

### Estimated Expenses

| | |
|---|---|
| Cost of Goat | $200.00 |
| Feed (grain and hay) | 75.00 |
| Livestock Insurance | 17.00 |
| Fair Liability Insurance | 35.00 |
| Show Supplies | 20.00 |
| Total Estimated Expenses | $347.00 |

### Estimated Receipts

| | |
|---|---|
| Sale of Goat (100 lbs. @ $4/lb) = | $400.00 |

©

| | |
|---|---|
| **Total Estimated Receipts** | $400.00 |
| **Total Estimated Expenses** | - 347.00 |
| **Estimated Net Profit** | $53.00 |

# Market Steer Project Plan Sheet

## Market Steer Project Budget

### Estimated Expenses

| | |
|---|---|
| Cost of animal | $1200.00 |
| Feed | 1200.00 |
| Show Supplies and Equipment | 10.00 |
| Insurance | + 90.00 |
| Total Estimated Expenses | 2500.00 |

### Estimated Receipts

| | | |
|---|---|---|
| Sale of steer (1250 lbs. @ $2.00/lb) = | $2500 | © |
| **Total Estimated Receipts** | $2500.00 | |
| **Total Estimated Expenses** | - 2500.00 | |
| **Estimated Net Profit** | 0.00 | |

# Poultry Meat Pen Project Plan

**Estimated Expenses**

| | |
|---|---|
| Cost of Animal (8) | $0.00 |
| Feed | 20.00 |
| Total Estimated Expenses | $20.00 |

**Estimated Receipts**

| | |
|---|---|
| Sale of Animal (2) | |
| Personal Sale= | 10.00 |
| Livestock Sale *Champion Only | 900.00 |

©

| | |
|---|---|
| **Total Estimated Receipts** | $900.00 |
| **Total Estimated Expenses** | - 20.00 |
| **Estimated Net Profit** | $880.00 |

# Dairy Replacement Heifer Project Plan Sheet

## Dairy Replacement Heifer Project Budget

### Estimated Expenses

| | 1 Yr. Project | 2 Yr. Project |
|---|---|---|
| Cost of Animal | $1300.00 | $500.00 |
| Feed 600.00 | 1000.00 | |
| Show Supplies and Equipment | 75.00 | 75.00 |
| Veterinary Supplies | 25.00 | 75.00 |
| Insurance | 80.00 | 60.00 |
| Breeding Fees | --- | 25.00 |
| Total Estimated Expenses | 2080.00 | 1735.00 |

### Estimated Receipts

| | | |
|---|---|---|
| Sale of Heifer | $2900.00 © | $3000.00 © |
| **Total Estimated Receipts** | 2900.00 | 3000.00 |
| **Total Estimated Expenses** | - 2080.00 | 1735.00 |
| **Estimated Net Profit** | $720.00 | $1245.00 |

# Rabbit Pen Project Plan Sheet

## Rabbit Pen Project Plan

### Estimated Expenses

| | |
|---|---|
| Cost of Animal (3) | $25.00 |
| Feed | 11.00 |
| Fair Liability Insurance | 0 |
| Fair Entry | 3.50 |
| Show Supplies | 5.00 |
| Total Estimated Expenses | $44.50 |

### Estimated Receipts

| | |
|---|---|
| Sale of Animal (3) | |
| Livestock Sale | $150 |

**The Students must provide their own BUYER for the Fair Auction.**

*Net Receipts:*

Livestock Sale (15lbs. @ 10$/lb) $ 150.00

*Supplies needed for the Fair:*

Towels, FFA Show Uniform, Feed and Bedding for the week.

# OH, Vegetable & Flower Project Plan Sheet

**Ornamental Horticulture, Vegetable and Flower Project Plan**

*Estimated Expenses:*

| | |
|---|---|
| Cost of Plants | $17.50 |

**The student must work 24 hours at the school gardens**.

*Estimated Receipts:*

| | |
|---|---|
| Premium from Fair | $225.00 |

*Net Receipts:*

| | |
|---|---|
| Premium from fair | $ 207.50 |

# Chapter Constitution

## Central Valley FFA Constitution

## ARTICLE I. - Name and Purpose

*Section A.* The name of this organization shall be known as the Central Valley – Ceres FFA Chapter.

*Section B.* The purposes for which this Chapter was formed are as follows:

1. To develop competent and assertive agricultural leadership.

2. To develop an awareness of the global importance of agriculture and its contribution to our well being.

3. To strengthen the confidence of students in themselves and their work.

4. To promote the intelligent choice and establishment of an agricultural career.

5. To stimulate development and encourage achievement in individual agricultural experience programs.

6. To improve the economic, environmental, recreational, and human resources of the community.

7. To develop competencies in communications, human relations and social abilities.

8. To develop character, train for useful citizenship, and oster patriotism.

9. To build cooperative attitudes among agriculture students.

10. To encourage wise management of resources.

11. To encourage improvement in scholastic ability.

12. To provide organized recreational activities for agriculture students.

## ARTICLE II.- Organization

*Section A.* The Central Valley Chapter of FFA is a chartered local unit of the California Association of FFA which is chartered by the National Organization of FFA.

*Section B.* This Chapter accepts in full the provisions in the constitution and bylaws of the California Association of FFA as well as those of the National Organization of FFA.

## ARTICLE III. - Membership

*Section A.* Membership in this Chapter shall be of three kinds: Active, Alumni, and Honorary as defined by the National FFA Constitution.

*Section B.* The Active Membership of this FFA Chapter shall transact all affairs within this Chapter.

*Section C.* Honorary Membership in this Chapter shall be limited to the Honorary Chapter FFA Degree.

*Section D.* Active Members in good standing may vote on all business brought before the Chapter. An active member shall be considered in good standing when:

1. They attend 6 of the local Chapter meetings.

2. They show an interest in, and take part in the affairs of the Chapter.

3. All bills are paid on time.

4. They are a true representative of the FFA as perceived by the Code of Ethics.

6. They are academically eligible to participate in activities according to the policy as established by the Ceres School District Board of Trustees.

*Section E.* Names of applicants for membership shall be filed with the Chapter Secretary.

## ARTICLE IV. - Emblems

*Section A.* The emblem of the FFA shall be the emblem for the Chapter.

*Section B.* Emblems used by the members shall be designated by the National Organization of FFA.

## ARTICLE V. - Membership Degrees and Privileges

*Section A.* There shall be four degrees that can be earned by an Active Member in this Chapter. These degrees are: Greenhand Degree, Chapter FFA Degree, State FFA Degree, and American FFA Degree.

*Section B.* All "Greenhands" are entitled to wear the regulation bronze emblem pin.
All members holding the "Chapter FFA Degree" are entitled to wear the silver emblem pin. All members holding the "State FFA Degree" are entitled to wear the regulation gold emblem charm. All members holding the "American FFA Degree" are entitled to wear the regulation gold key.

*Section C.* Minimum qualifications for obtaining the four degrees of Active Membership shall be those listed in the National FFA Constitution as amended by the State FFA Assn.

*Section D.* The minimum qualifications for the Greenhand Degree :

1. Attend 4 or more Chapter meetings, including the Greenhand Degree Meeting.
2. Attend 2 other activities at or above the Chapter level.
3. Be regularly enrolled in an agriculture class and have a S.A.E.P. plan .
4. Be familiar with the purposes of the FFA and the Chapter's Program of Work.
5. Have learned and can explain the meaning of the creed, FFA motto, and salute.
6. Can explain the proper use of the FFA Jacket.
7. Can identify the historical highlights of the FFA.
8. Have access to a FFA Manual.
9. Have submitted an application.

*Section E*. The minimum qualifications for the Chapter Degree:

1. Must have completed 50 hours and or earned $100.00 in a valid S.A.E.P. project.

2. Must have a valid project and up to date record book as designated by the Agriculture Teacher.

3. Must attend 5 or more Chapter meetings, including the Chapter Degree Meeting.

4. Be regularly enrolled in an agriculture class and have an active S.A.E.P.

5. Must have received the Greenhand Degree.

6. Must participate in at lease 3 chapter activities.

7. Must have led a group discussion for 15 minutes.

8. Have demonstrated 5 procedures of parliamentary law.

9. Have a satisfactory scholastic record.

10. Submit an application for the Chapter FFA Degree.

*Section F.* The minimum qualifications for the State FFA Degree.

1. Qualification for the State FFA Degree shall be those set forth in the Constitution of the National FFA Association.

## ARTICLE VI. - Officers

*Section A.* The Officers of the Chapter shall be as follows: President, Vice-

President, Secretary, Treasurer, Reporter, and Sentinel. The local Advisor(s) shall be the teacher(s) of agriculture at Central Valley High School. Each of the Officers has their designated duties; they are as follows.

1. ***The President*** shall preside over and conduct meetings according to accepted parliamentary procedure, call special meetings, keep members on the subject and within the time limits, appoint committees and serve as ex-officio member of them, call other officers to the Chair as necessary or desirable, represent the Chapter and speak on occasions, coordinate Chapter efforts by keeping in close touch with the other Officer and Advisor(s), and keep Chapter activities moving in a satisfactory manner, represent the Chapter on the Central Valley School Student ASB Council, and represent the Chapter at the National FFA convention or designate a replacement.

**2.** ***The Vice-President*** shall assist the President when needed, have charge of committee work, preside at meetings in the absence of the President, be prepared to assume the duties and responsibilities of the President, and obtain end of activity reports from the committee chairpersons.

3. ***The Secretary*** shall prepare and read the minutes of meetings, have available for the President the list of business for each meeting, attend to official correspondences, send out and post notices, count and record rising votes, prepare chapter records, keep the permanent records of the chapter, cooperate with the Treasurer in keeping accurate membership roll, issue membership cards, call meetings to order in the absence of a presiding officer, read communications to the members at meetings, and post the meeting agenda at least twenty-four hours in advance of the meetings.

4. ***The Treasurer*** shall receive and act as custodian of Chapter funds, collect assessments, send in Sectional, State, and National dues, assist in preparing an annual budget, keep the financial records of the Chapter, and pay out funds as authorized, prepare financial statements and reports, build up the Chapters financial standing, and submit in writing a financial report at each meeting. Handle any bills as follows: older than 15 days, student and parents will receive a billing; bills 20 days old, student will be called into a Conference with the Chapter Officers; any bills older than 30 days old, the student will be listed in poor standing and shall lose all rights as an Active Member until his/her bill has been paid and a hold will be placed on records and books.

5. ***The Reporter*** shall gather and classify Chapter news, prepare news notes and articles for publication or broadcast, contact local newspapers, send news to State and National publications, arrange for FFA participation in local radio and TV programs, and keep an up to date Chapter scrapbook with the assistance of the Chapter Historian. The Reporter shall submit the Chapter scrapbook for judging at the Spring Regional Meeting and shall prepare a Chapter Newsletter for publication with the assistance of the Advisor.

6. ***The Sentinel*** shall set up the meeting room and care of Chapter paraphernalia and equipment, attend the door during meetings and welcome visitors, see that the meeting room is kept comfortable, take charge of candidates for degree ceremonies, and assist the President in maintaining order.

7. ***The Historian*** The Historian shall develop and maintain a scrapbook of memorabilia to record the chapters history, research and prepare items of significance to the chapter, prepare displays of the chapter and submit article of past member to the media. They shall assist the reporter.

8. ***The Advisor(s)*** shall assist the officers in running the Chapter and advise them as the need arises.

9. Each Chapter Officer is required to participate in at least three leadership activities such as Parliamentary Procedure, Public Speaking, or a Judging Team.

10. Each Officer shall have basic knowledge of Parliamentary Procedure.

*Section B.* Officers of the Central Valley FFA shall be elected annually by majority vote of the members present at the Election FFA Meeting.

*Section C.* Chapter Officers must hold the Chapter FFA Degree or be in the position to receive the Chapter FFA Degree at the November FFA Meeting.

*Section D.* If there is a need to fill an Officer vacancy during the term, it shall be appointed by the Chapter Officers with assistance from the Advisor, with the exception of the President whose vacancy shall be filled by the Vice President. After any one office is appointed by the Chapter Officer Team, it is then the Advisor(s) duty to appoint any other officer during that particular term. A person cannot fill a position without their consent.

*Section E*. Any Chapter Officer placed on academic probation shall be allowed one academic quarter to bring there grade up. They must provide either Director with a grade check every two weeks with every teacher signature. If the grade does improve to the required GPA after the given quarter he/ she is to in writing, resign from office at the first appropriate FFA Chapter Officer meeting. The Chapter Officer Team then shall replace the vacant office according to the constitution.

*Section F*. Chapter Officers missing more than four Chapter meetings without giving a two-day notice shall be considered removed as an officer.

## ARTICLE VII. - Greenhand committee

*Section A.* The Greenhand Officers shall consist of freshman committee members that are assigned executive committee chairs.

It is up to the determination of the Executive commitee to asssemble a greenhand Committee. If decided, the Greenhand Committee shall consist of members that are assigned executive committee chairs.

*Section B.* Consists of, but is not limited to:

***Wrecking Crew***- shall set up meeting supplies and assist with clean up.

***Food and Fundraising***- assist the officers and advisers when refreshments are necessary.

***Web Master***- shall assist the reporter with social media and photograph chapter events.

***Bulletin Board Designer***- shall keep the bulletin board up to date with chapter news and events.

**Community Service**- shall organize community events alongside officers

**Publicity**- shall assist the officers with advertising and publicizing FFA activities and events.

*Section C.* The Greenhand Committees shall work with the officer team to strengthen member involvement and assist them in coordinating events that involve their respective chair.

*Section D.* Any Greenhand Committee Member placed on academic probation shall, in writing, resign from office at the first appropriate FFA Chapter Officer meeting. The Chapter Officer team then shall replace the vacant office according to the constitution.

*Section E.* Greenhand Committee Members missing more than four Chapter meetings without giving a two-day notice shall be considered removed as an member.

*Section F.* The Greenhand Committee shall be selected by agriculture advisors after completing an application.

## ARTICLE VIII. - Executive Committee

*Section A.* The Chapter Executive Committee shall be composed of the six Chapter Officers, Greenhand President, Historian, BOAC Chairman, Committee Chairman, Newsletter Chair, Web Master, Chapter Sweetheart, and the Advisor(s)

*Section B.* The Historian, BOAC Chairman, Newsletter Chair, Chapter Sweetheart, Web Master, and Committee Chairman shall be appointed by the Chapter Officers during the Chapter Officers retreat.

*Section C*. The Chapter Officers and Advisor(s) shall be the final authority on all decisions relating to the Chapter and shall be responsible or nominating the Honorary Chapter Farmer, selecting the recipients of the Certificates of Appreciation, and shall, when necessary, conduct special meetings open only to the Officers and Advisor(s).

*Section D.* ***The Historian*** along with the Chapter Reporter shall, be responsible for developing and maintaining the Chapter Scrapbook. The Historian is to attend all Executive and Chapter Meetings.

*Section E.* ***The Community Service Chairman*** shall be responsible for the Chapters efforts in organizing community service projects. The Community Service Chairman will attend all Executive and Chapter Meetings.

*Section F.* ***The Scrapbook Chair*** shall be responsible for designing, maintaining, and monthly Scrapbook pages of all activities done by the chapter at state, regional, chapter, and national levels. The Scrapbook Chair is to attend all Executive and Chapter Meetings.

*Section G.* ***The Wrecking Crew Chairman*** shall be responsible for all set up and clean up of chapter meeting and activities. The Wrecking Crew Chair is also in charge of maintaining meeting paraphernalia . The Wrecking Crew Chairman is to attend all Executive and Chapter meetings.

***The Publicity Chairman*** shall be responsible for the advertisement and publicity of all chapter events and activities.

*Section H.* ***The Web Master*** shall be responsible for designing and maintaining the
Chapter's Web Page.

*Section I.* A member of the Chapter Executive Committee that misses more

Than two Executive Committee meetings or two Chapter Meetings without providing a two-day notice shall be replaced.

*Section J.* Any member of the Chapter Executive Committee placed on academic
Probation shall, in writing, resign from office at the first appropriate FFA Chapter Officer Meeting. The Officer Team then shall replace the vacant office/committee chairman according to the constitution.

## ARTICLE IX. - Disciplinary Actions

*Section A.* Any Chapter Officer may be impeached by a two-thirds vote of the Chapter members present at any specially scheduled meeting. Possible reasons for
impeaching an officer include, but are not limited to: Not fulfilling duties as required by the Constitution, not portraying the proper image of an FFA Member as established by the Chapter Code of Ethics, losing respect of fellow Chapter Officers, Members, Advisors, or the Community. The Officer up for impeachment will go through an interview with an administrator and Agriculture Teachers.

*Section B.* Any officer missing more than four Officer Meetings, two FFA Meetings, and or breaking any part of the Officer Contract without notifying the Agriculture Advisor(s), with the exception of verifiable cause at least two days prior to the event shall be replaced as an officer at the next regularly scheduled Chapter Meeting.

## Article X - Meetings

*Section A.* Regular chapter meetings shall be held once a month during the school year. Special Meetings may be called at any time.

*Section B.* Any sophomore or Junior with a minimum of the chapter FFA Degree shall be eligible to be a delegate for the Chapter at the State FFA Convention.

*Section C.* The members present at a regular chapter meeting shall constitute a quorum and a quorum must be present at any meeting at which business is transacted or a vote taken committing the chapter to any proposal or action.

## Article XI - Amendments

*Section A.* Proposed amendments to the constitution must be presented to the members at a regular chapter meeting, posted on the bulletin board in the classrooms and voted on at the next regular meeting. Any constitutional amendment requires a 2/3 vote of the active members present and must not conflict with the bylaws of the State and or National Associations.

## Article XII – Letter and Cords

*Section A. Minimum Requirements for a Letter:*

F. Minimum enrollment in Agriculture for two years.
G. Must qualify and apply for the State FFA Degree.
H. Must have a 3.00 G.P.A. in ALL your Agriculture classes
I. Must have a 2.50 G.P.A. overall.
J. Must have attended six of the seven events below, please check the ones that you have completed:

12. Attend Camp Sylvester
13. Be a Delegate for the Regional Meeting or State FFA Conference
14. Participate in Sectional Project Competition
15. Attend Judging Contest or Event on a Judging Team
16. Must attend at least six FFA Meetings per year
17. Must attend the Chapter Banquet every year
18. Be a Green Hand or Chapter Officer or Committee Chairperson
19. Participate in the Stanislaus County Fair
20. Participate in at least two Communities Service Activities on Campus per year
21. Participate in a least two community service activities off campus per year
22. Participate in a least two community service activities off campus per year

F. All requirements must be verifies by the FFA Record Books

*Section B. Minimum requirements for a FFA Patch or FFA Bar:*

C. Same requirements for Letter except for B.
D. Must have the Chapter FFA Degree

*Section C. Requirements for the FFA Graduation Cords*

C. Must have a 3.00 G.P.A. in Agriculture and or overall school G.P.A.
D. Cord Colors:

1. Blue and Gold – Holds the State FFA Degree
2. Gold – Enrolled in Agriculture for four years and have completed the minimum requirement for a FFA Patch or FFA Bar
3. Blue – Enrolled in Agriculture for three years and have completed the minimum requirement for a FFA Patch or FFA Bar

4. White – Enrolled in Agriculture for two years and have completed the minimum requirement for a FFA Patch or FFA Bar

C. Must attend 6 of the eleven events, please check the ones that you have completed:

1. Attend Camp Sylvester
2. Be a Delegate for the Regional Meeting or State FFA Conference
3. Participate in Sectional Project Competition
4. Attend Judging Contest or Event on a Judging Team
5. Must attend at least six FFA Meetings per year
6. Must attend the Chapter Banquet every year
7. Be a Green Hand or Chapter Officer or Committee Chairperson
8. Participate in the Stanislaus County Fair
9. Participate in at least two Communities Service Activities on Campus per year
10. Participate in a least two community service activities off campus per year
11. Participate in a least two community service activities off campus per year

D. Your FFA Record Books must verify all requirements.

## General Rules Governing Central Valley FFA Members at Chapter Activities And While Wearing the Official FFA Jacket

## *I Procedure*

A. Prior to entering a FFA activity governed by the rules or the acquisition of The official FFA Jacket, each FFA Member will read a copy of the rules and sign a statement indicating their intent to follow the prescribed rules.

B. Each student entering a chapter activity must be accompanied by an Instructor or chaperon, and this person must be with their students during the night, prevent noise and other disturbances that may interfere with the welfare of other individuals. Every effort must be made to maintain orderly, quiet and proper conduct at all times. Any violations will be considered cause for disciplinary action determined by the Chapter Executive Committee.

C. The activities that the Central Valley FFA Members will be allowed to participate in are outlined in the Chapter Program of Activities.

## *II. General Rules*

C. Members are prohibited from smoking, drinking, and doing illegal drugs while wearing the FFA Jacket, officially representing the organization, and or taking part in any official activity.

B. The use of, possession of, firecrackers or weapons or any piece of equipment hat may subject anyone to injury will be grounds for immediate expulsion from show or activity.

C. No member is to leave the grounds of an activity without the permission of their instructor. No vehicles are to be used at any time without the approval of the instructor in charge.

D. Ladylike and gentlemanly conduct is expected at all times. Obscene language and roughhousing will not be tolerated at any time.

E. Gambling in any from is strictly forbidden.

F. Students who are reported to the advisor for the neglect of livestock will be brought before the school and department administration for appropriate action.

G. Appropriate dress will be required at activities participated in by the FFA. All members shall be expected to use good judgement in dress and shall wear the recognized uniform for the members when applicable. The school dress code shall be enforced.

H. Any display of overly affectionate attention between boy and girl members shall be discouraged by advisors. Persistent abuse of this rule shall be cause for suspension from the show or activity.

I. Hair shall be clean, cut and neat in appearance to be decided by the advisors.

J. It is highly recommend that any items that are valuable, or will be a problem to lock up will be left at home.

## ***III. Official FFA Jackets***

A. The jacket is to be worn only by active members.

B. The jacket should be kept clean and neat.

C. The jacket should have only a large emblem on the back and a small Emblem on the front. It should carry the name of the State Association and the name of the local chapter, district, or area on the back and the name of the individual and one office or honor on the front.

D. The jacket should be worn on official occasions with the zipper fastened to the top. The collar should be turned down and the cuffs buttoned.

E. The jacket should be worn by members and officers on all officials FFA Occasions, as well as other occasions where the chapter or state association is represented. It may be worn to school and other appropriate places.

F. The jacket should only be worn to places that are appropriate for Members to visit.

G. School letters and insignia of other organizations should not be attached to or worn on the jacket.

H. When the jacket becomes faded and worn, it should be discarded or the Emblems and lettering removed.

I. The emblems and lettering should be removed if the jacket is given or sold to a non-member.

L. A member always acts like a lady or gentleman when wearing the jacket.

M. Members should refrain from use of tobacco and alcohol while wearing the FFA jacket or officially representing the organization.

L. All chapter degree, officer and award medals should be worn beneath the name on the right side of the jacket, with the exception that a single State FFA Degree charm or American FFA Degree key should be worn above the name or attached to a standard key chain. No more than three medals should be worn on the jacket. These should represent the highest degree earned, the highest office held and the highest award earned by the member.

M. Violation of the above rules governing the use of the official FFA Jacket will Warrant the Executive Committee to revoke the member's ownership of the jacket.

## *IV. Fair Exhibits and Exhibitors*

A. You, your animal and your chapter are on exhibit during the entire show. You are expected to keep the exhibit area and adjacent aisles clean at all times.

B. Stalls must be cleaned, with old bedding put into the designated areas by 7:00 a.m. The aisles must be kept clean at all times, this if for safety and health of your project, as well as a feature of your exhibit.

C. Each exhibitor is responsible for their own projects at all times. If they Cannot be present they must have prior approval of their instructor to leave. The person designated to care for the animals must be present at he fair.

E. Destruction of property, not cooperating with employees of the show or Cooperating groups all add up to a bad image, not that of a FFA member; thus you will be expected to cooperate at all times. Exhibitors will be held responsible for damage to any facilities or equipment.

## *V. Dormitory*

A. Each fair has written dormitory as to the time each member is to check in. It is the member's responsibility to familiarize themselves with these rules abided by them.

B. You are expected to keep your dormitory are clean of refuse, you bed, and the bunk area policed.

## VI. Disciplinary Action

A. Individuals who have been found to have violated any of these rules will be subject to disciplinary action by the school and department administration.

D. If the violation warrants it, the administration has the authority to immediately bar the individual or individuals involved from any further FFA activities, ownership of the official FFA jacket, and membership of the organization.

### *VII. Members in Good Standing*

A. Every member will start out in good standing. Only by their actions will their standing becomes unsatisfactory as deemed by the Agriculture Advisors.

# K. School and/or Department Policies Pertaining to:

## Student Eligibility to Participate in out-of-class Activities
## Leadership development integrations into the program
## SOE integration into program and other policies

## School and/or Department Policies Pertaining to:

- **Student Eligibility to Participate in out-of-class Activities**
- **Leadership development integrations into the program**
- **SOE integration into program and other policies**

<u>Central Valley High School Student Handbook Policies Pertaining to FFA Students</u>

* Activity eligibility is applied to all students on the FFA officer team and judging teams
**Eligibility Standards**:
• A minimum of a "C" average (2.0 grade point average per quarter).
• No more than one (1) "F" in the certification period.
• Incomplete grades (I) count as "F" for eligibility purposes.
• No outstanding school fines or debts (unless arrangements have been made with the principal or
designee).
• May not be absent in excess of 20 days during the current school year.
Note: Eligibility may not be changed after the end of a grading period. The only exception is if the ineligibility was the result of a teacher error. Any change in eligibility must be approved by the principal.
**Eligibility Probation**:
• All incoming freshman will be given eligibility. Ninth grade students who fail to maintain their eligibility will remain ineligible during the remainder of their freshman year.
• Tenth, Eleventh and Twelfth grade students will be eligible for a one time waiver at any time during
their final three years of high school if they have less than a 2.0 GPA and no more than two F's in the
preceding grading period. The summer school option is no longer be available.
**Activities Eligibility**:
• All ASB Officers and Leadership students as well as Homecoming/Winterfest candidates must meet the following requirements:
o A minimum of a "C" average (2.0 grade point average per quarter).
o No more than one (1) "F" in the certification period.
o Incomplete grades (I) count as "F" for eligibility purposes.
**Senior Activities Eligibility**:
In order for seniors to participate in extra-curricular activities (Winter Formal, Senior Trip, graduation
ceremony, etc.) students must meet the following eligibility requirements:
• Must be on track for graduation.
• No fines or outstanding debts.
• May not be absent in excess of 20 days during the current school year.
**Field Trips**:
Parental consent slips are required of all students going on school sponsored field trips. All school rules apply while on field trips.

Ag Department Rules for Judging Teams and Stanislaus County Fair

CERES UNIFED SCHOOL DISTRICT AGRICUULTRE DEPARTMENTS
GENERAL FAIR RULES

1. All rules and regulations of Ceres Unified School District will apply to students who participate in fairs, since showing is a school activity.

2. All exhibitors are to follow the directions and advice given to them by the designated advisor for that project. The advisor's directions are to be followed for the length of time the project is eligible for show and during the fair when the project is being exhibited.

3. Each exhibitor is expected to read and understand the rules and regulations in the Fair's premium book.

4. All exhibitors are expected to remain on the fairgrounds or approved area while under the supervision of a chapter advisor.

5. Each exhibitor is responsible for feeding, water, grooming, and caring for his or her own animals during the entire length of the fair. It is not the job of the student on barn duty to care for the animals in that area.

6. Each exhibitor is required to serve barn duty as assigned and specified by the species advisor. An exhibitor will be expected to serve barn duty in each area where he or she has an exhibit. SEE FAIR FINE SCHEDULE.

7. All FFA exhibitors will be required to wear the official FFA uniform while showing their animals.

Boys - White pants, white shirt with collar, official FFA tie, and official FFA jacket.
Girls – White pants, white blouse with collar, official scarf, and official FFA jacket.

8. All FFA exhibitors are required to attend the awards program at the end of the fair.

9. Exhibitors that sell animals are required to write a THANK YOU letter to each of their buyers and a copy of the letter must be given to the advisor prior to receiving their check.

10. All exhibitors must attend all assigned meetings, unless prior arrangements have been made.

11. All exhibitors are expected to make arrangements with the advisors to haul their animals and tack to the fair.

12. All exhibitors are required to participate in the Showmanship and Chapter Group contests for their species area.

13. All exhibitors must turn in their record books in July to be checked for progress and are current. Then the exhibitors must turn in their books in August after the fair to check for completeness.

14. All exhibitors must check out with the species advisor and have their record books up to date before checks will be given out.

15. Any graduate of Ceres Unified School District Agriculture Departments may show animals one calendar year after the date of graduation. They must meet the following requirements to do so.

1. Have attended 3 of the FFA meetings prior to the Fair meeting.

2. Have their record books up to date and on the computerized record book program as of September 1 of the year they graduate.

3. Be no more than $300.00 and 200 hours away from getting their State FFA or American Degree, as proven by the computerized record book.

4. Abide by all of the fair rules and guidelines set by the species advisor.

I have read each of these general rules and understand each of them. I understand that any of the advisors, of Ceres Unified School District Agriculture Departments will have the authority to take whatever disciplinary action is necessary toward any student that fails to comply with these rules.

Parent Signature ___________________________________ Date ________________

Student Signature __________________________________ Date ________________

CERES UNIFED SCHOOL DISTRICT
AGRICULTURE DEPARTMENTS

FAIR FINE SCHEDULE

If you are more than 15 minutes or a specified time: late to feed, clean pens, attend project meetings, attend awards ceremony and or out of uniform or to barn duty, you will be assigned 1hour labor per 15 minutes late.

Every 15 minutes = 1 hour labor to be determined by the Advisors

I have read and understand the fine schedule. I understand that any of the advisors, of Ceres Unified School District Agriculture Departments will have the authority to take whatever disciplinary action is necessary toward any student that fails to comply with these rules.

Parent Signature ________________________________ Date ____________

Student Signature _______________________________ Date _____________

CERES UNFIED SCHOOL DISTRICT
FFA FAIR CODE OF CONDUCT

1. Any area housing livestock and the show area shall be considered a CUSD classroom.

2. All school rules apply.

3. Student violating any school rule, may at the discretion of the FFA advisor, be prohibited from any further participation in the fair.

a. In the event that is occurs the student will be asked to immediately remove their animal from the premises.

b. If the animal is not removed by the end of the 5th day CUSD FFA advisors will arrange transportation for the animal of the exhibitor, at the owner's expense.

c. Parents or Guardians will be notified of pending consequences prior to implementation.

4. The rules governing who may participate at the fair is left to the discretion of the FFA advisors and are as follows:

The student must;
a. Have satisfactory citizenship
b. Attend all meetings for their project area.
c. Attend all workdays for the fair.
d. Have legal ownership of all animals that are to be exhibited.
e. Have signed set of current fair rules on file with the advisors.
f. Be a member in good standing.
g. Be:
A) enrolled as an Ag student of CHS or CVHS or
B) have graduated the prior year and are applying for their State or American FFA Degree
h. Have a passing grade in current Agriculture Classes.

I have read and understand each of the above rules and agree to abide by each of them.

Parent Signature ______________________________________ Date _________________

Student Signature ______________________________________ Date _________________

CENTRAL VALLEY FFA
CDE TEAM Contract 2014-2015

To be a member of a Central Valley CDE Team, you must be willing to make a true commitment. It will take several hours of your time, working in harmony with your team members and coach to fulfill the responsibilities to your team.

I. You must work as a member of a team, realizing that all team members are of equal importance.

II. You will make the commitment to attend all practices and contests in their entirety. You are also responsible for communicating these FFA commitments to your parent/guardians!

III. You will not miss an assigned responsibility without receiving prior approval from your coach. You MUST inform the coach at least two weeks in advance. Failure to attend team practices or contests without prior approval from your coach can result in removal from the team.

IV. A 2.0GPA must be earned at each quarter grading period throughout the duration of the team. In addition, a team member cannot have a D or F in any agriculture classes, even if they have maintained a 2.0GPA. Failure to maintain the above academic record will result in being terminated from the CDE team.

V. FFA Advisors have the right to remove any team member for disciplinary actions issued by Central Valley High School. This includes conviction of a serious legal offense or any other action that would bring discredit to the school or chapter, including being suspended or expelled from school, ANY use of tobacco, drugs, or alcohol regardless of whether it is during an FFA activity or if it is on personal time. Team members will not use profane or abusive language while in FFA uniform or during any official FFA function.

VI. In order to compete at the CDE State Finals Contest, the team must place in the top 15 at TWO contests during the competitive season.

Central Valley FFA members generally receive a great deal of attention as a result of the talent, accomplishments and reputation the Central Valley FFA Chapter has with other students, FFA members, school faculty and staff, and community members. As a result, Central Valley FFA CDE Team member are expected to demonstrate leadership by setting positive examples of personal conduct both in and out of the agriculture department.

I, ______________________________ fully understand all of the CDE team member expectations and hereby agree to devote all time necessary for the completion of that team. I am fully aware that if I do not fulfill my team obligations or fail to comply with any of the above standards that I can be removed from the CDE team.

____
FFA Member Signature Date

______________________________
Parent/Guardian's Signature Date

SIGNED CONTRACT DUE THURSDAY JANUARY 15th
at 6:00pm at the MANDATORY CDE Judging Team Member & Parent Meeting at Central Valley High School

# Proficiency Standards Pertaining to Program Completers

## Proficiency Standards Pertaining to Program Completers

Central Valley Agriculture Department developed its own course expected outcomes in 2014 to create continuity between pathway courses. This is mainly focused on the agriculture CTE standards however a focus of our school in the past 2 years has been to incorporate Literacy Standards for science and technical subjects, California Common Core Standards, and in Agriscience, Next Generation Science Standards.

### Course Expected Outcomes

Developed 2013-2014 school year. Do not reflect 2015-16 and 2016-2017 course changes.

### Ag Mechanics Pathway

**Intro to Ag Mechanics**

43. FFA and California Agriculture
44. Measurement
45. Tool ID
46. Shop safety/ procedures
47. Tie 8 knots and 3 splices
48. Sheet metal layout and fabrication
49. Pipe joints for steel, copper, and PVC and common fittings used
50. Fabrication of cold metal and fasteners used to join them
51. Wiring a basic circuit and principle of electricity
52. Wood layout and fabrication of wood joints
53. Basic plan reading
54. Basic bill of materials
55. Basic layout
56. Introduction to welding

**Intro to Ag Welding**

25. Demonstrate safe shop procedures and machinery operation.
26. Apply oxy-acetylene cutting theory to cut, pierce, and bevel steel.
27. Safely set-up and cut using the plasma arc machine.
28. Set-up, adjust, and weld correctly using SMAW in the flat and vertical positions using 6011,6013, and 7018 rods.
29. Set-up, adjust, and weld correctly using GMAW in the flat and vertical positions.
30. Properly layout and cut using CAD plans.
31. Fabricate a project that is structurally square and stable.
32. Create a bill of materials after project completion.

**ROP Welding**

16. Apply SMAW out of position using 6011 7018
17. Apply GMAW out of position
18. Set-up, adjust, and weld using TIG welding
19. Apply metal processing of oxy-acetylene and plasma to cut metal
20. Demonstrate project construction and structural design principles

**ROP Welding Fabrication**

4. Construct projects using SMAW, GMAW, TIG, and Oxy- Acetylene welding

## Power Mechanics Pathway

**Intro to Ag Mechanics**

40. FFA and California Agriculture
41. Measurement
42. Tool ID
43. Shop safety/ procedures
44. Tie 8 knots and 3 splices
45. Sheet metal layout and fabrication
46. Pipe joints for steel, copper, and PVC and common fittings used
47. Fabrication of cold metal and fasteners used to join them
48. Wiring a basic circuit and principle of electricity
49. Wood layout and fabrication of wood joints
50. Basic plan reading
51. Basic bill of materials
52. Basic layout

**Intro to Ag Welding**

25. Demonstrate safe shop procedures and machinery operation.
26. Apply oxy-acetylene cutting theory to cut, pierce, and bevel steel.
27. Safely set-up and cut using the plasma arc machine.
28. Set-up, adjust, and weld correctly using SMAW in the flat and vertical positions using 6011,6013, and 7018 rods.
29. Set-up, adjust, and weld correctly using GMAW in the flat and vertical positions.
30. Properly layout and cut using CAD plans.
31. Fabricate a project that is structurally square and stable.
32. Create a bill of materials after project completion.

**Intro to Power Mechanics**

28. Use Micrometers
29. 3 engine systems: ignition, carburetion, compression
30. Torque
31. Read technical writing
32. Basic parts ID
33. Use manual to look up part numbers
34. Basic tool ID
35. Basic cold metal fabrication
36. Basic engine overhaul

**ROP Power Mechanics**

25. Perform a complete engine overhaul
26. Look up part numbers using the mechanics manual
27. Complete work orders
28. Engine diagnostics and trouble shooting
29. Advanced tool ID
30. Basic part fabrication
31. Use diagnostic equipment
32. Use torch wrench

## Ornamental Horticulture

**Intro to Plant Production**

28. FFA and California Agriculture
29. Equipment safety
30. Plant propagation- sexual and asexual
31. Plant nutrition- macro and micro nutrients, organic and inorganic
32. Weed Control and identification- cultural and chemical
33. Pest Control and ID- organic and inorganic methods
34. Plant management- pruning, training, and harvest
35. Safe food handling- harvest, production, process, and storage
36. Disease control- prevention and treatment

**ROP Intro to Floriculture**

25. FFA and California Agriculture
26. Safe handling of floral sheers and knife
27. Identify 20 flowers, 20 potted plants, 20 tools
28. Construct a boutonnière
29. Construct a corsage
30. Construct a centerpiece arrangement
31. Complete a floral arrangement price sheet
32. Understand color concepts

**Advanced Plant Production**

25. Equipment operation- cultivate, bed preparation, mower, edger, blower
26. Apply Plant propagation- sexual and asexual
27. Apply Plant nutrition- macro and micro nutrients, organic and inorganic
28. Apply Weed Control and identification- cultural and chemical
29. Apply Pest Control and ID- organic and inorganic methods
30. Apply Plant management- pruning, training, and harvest
31. Apply Safe food handling- harvest, production, process, and storage
32. Apply Disease control- prevention and treatment

**ROP Ag Advanced Floriculture**

28. Safely handle tools
29. Identify all cut flowers, potted plants, and tools
30. Construct various artistic arrangements
31. Apply color concepts
32. Contemporary design styles and techniques
33. Complete retail and labor cost sheets
34. Peer and self analyze arrangements
35. Understand historical and cultural theory
36. Evaluate floral artwork

## <u>Animal Science Pathway</u>

**Intro to Animal Agriculture**

37. FFA and California Agriculture
38. Breeds- beef, sheep, swine, horse, chickens, dairy, dairy goats
39. Terminology
40. Digestive systems- ruminant, mono-gastric, and poultry
41. Grooming

42. Housing and equipment
43. Animal safety
44. Segments of the livestock industry
45. California agriculture and meats
46. Restraints
47. Animal identification
48. Basic external anatomy

**Animal Science**

28. Digestive systems and processes
29. Injection types- IM, IV, IR, Subcutaneous, intradermal
30. Animal Marketing- meat, mohair, wool, by products
31. Selection of animals
32. Showing
33. Basic animal husbandry
34. Nutrition and feeding
35. Reproduction and breeding
36. Genetics

**Vet Science**

25. Diseases of Livestock
26. Ethics and ethical treatment of public animals
27. Administration of medications
28. Medical examinations/ wound management
29. Fecal and urine samples
30. Anatomy and physiology
31. Animal behaviors
32. Surgical Instruments

## Agriculture Sciences

**Ag Chemistry**

28. Know the parts of the atom, its density, and how atoms are arranged on the periodic table
29. Know chemical bonding and how it applies to chemical reactions
30. Be able to balance chemical equations
31. Apply gas laws to specific situations
32. Understand principles of solutions and molarity for purposes of developing different concentrations
33. Apply acid and base knowledge to solutions for plant and animal health
34. Know nuclear chemistry and how matter affects it
35. Apply biochemistry to food production
36. Agriscience Fair emphasis on experimental design

**Ag Biology**

22. Cell organization and processes
23. Reproduction of plants and animals
24. Genetics
25. Evolution
26. Physiology of plants and animals
27. Ecology
28. Investigation and experimentation

**Advanced Ag Biology**

25. Agriscience Fair emphasis on experimental design
26. Cell organization and processes
27. Reproduction of plants and animals
28. Genetics
29. Evolution
30. Physiology of plants and animals
31. Ecology
32. Investigation and experimentation

## California CTE Standards

## Agriculture and Natural Resources Industry Sector

### A. Agricultural Business Pathway

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

A1.0 Students understand decision-making processes within the American free enterprise system:
A1.1 Differentiate among the components of the American free enterprise system and other forms of economic systems.
A1.2 Distinguish among the main characteristics of individual proprietorships, partnerships,
corporations, and cooperatives.
A1.3 Understand the advantages and disadvantages of the four types of business ownership.
A1.4 Analyze appropriate decision-making tools and financial records to make key management decisions.
A1.5 Analyze physical production relationships to determine optimum use levels.
A1.6 Understand how to calculate the fixed and variable costs associated with the production of agricultural products and determine the output level that will
yield maximum profit.
A2.0 Students understand the fundamental economic principles of agribusiness and agricultural
production:
A2.1 Understand how basic economic factors affect agricultural production and agribusiness management decisions.
A2.2 Know basic agricultural economic terminology.
A2.3 Understand the law of supply and demand as it effects price determination.
A2.4 Analyze how agriculture uses scarce resources to meet the needs and demands of its consumers.
A2.5 Differentiate between elastic and inelastic supply and demand.
A2.6 Understand the law of diminishing returns and its impact on agricultural production.
A3.0 Students understand the role of credit in agribusiness and agricultural production:
A3.1 Analyze the factors that determine the cost of credit in order to select optimum credit sources (e.g., the advantages and disadvantages of borrowing from the

various types of credit providers and sources for short-, intermediate-, and long-term credit).
A3.2 Know the criteria lenders use to evaluate repayment capacity.
A3.3 Analyze balance sheets and cash-flow statements to determine the ability to repay loans.
A4.0 Students understand proper accounting principles and procedures used in business management and tax planning:
A4.1 Understand the differences between cash and accrual accounting systems.
A4.2 Understand the use and importance of budgets, income statements, balance sheets, and financial statements.
A4.3 Understand the basis of taxation within the tax system and its impact on the economy, including the role of taxes in agribusiness.
A4.4 Analyze the role of depreciation and purchasing in tax planning and liability.
A4.5 Understand how to determine property values and how to complete a depreciation schedule.
A4.6 Understand how to determine the tax obligations for an agribusiness.
A5.0 Students understand basic risk management principles and their impact on economic
viability:
A5.1 Understand environmental responsibility and its impact on agribusiness.
A5.2 Understand the concept of liability and the economic impact of being held liable.
A5.3 Understand the concept and process of risk management, including the use of risk management tools such as insurance.
A5.4 Understand how recordkeeping, farm plans, and an analysis of best practices affect risk management decisions.
A5.5 Understand the role of contingency plans in risk management.
A6.0 Students understand the role and value of agricultural organizations:
A6.1 Understand the benefits of private, public, and governmental organizations, including the value and impact of cooperatives.
A6.2 Understand how participation within organizations would be beneficial in supporting various agricultural operations.
A6.3 Understand how to identify and electronically access public and private agricultural organizations.
A7.0 Students understand agricultural marketing systems:
A7.1 Understand how marketing functions in a free market society.
A7.2 Understand the advantages and disadvantages of the various marketing options for agricultural products and services.
A7.3 Understand how the law of comparative advantage affects agricultural production.
A7.4 Understand the impact of advertising and promotion on the marketing of agricultural
products and services.
A7.5 Understand how promotion trends for agricultural products influence individuals.
A7.6 Understand how to develop a marketing plan for an agricultural product or service.
A8.0 Students understand the sales of agricultural products and services:
A8.1 Determine the most effective methods for assessing customer needs and wants.

A8.2 Understand the stages in making a successful sale and the various techniques used to approach potential customers and overcome their objections.
A8.3 Examine the physiological and psychological factors that influence motivation to purchase, including the fundamental steps in making a purchase.
A9.0 Students understand local, national, and international agricultural markets and how trade affects the economy:
A9.1 Understand how the importance of agricultural imports and exports affects state and national economies.
A9.2 Know how governmental, economic, and cultural factors affect international trade.
A9.3 Compare and contrast United States trade policies with those of other important trading partners.
A9.4 Understand how biotechnology affects trade and global economies.
A9.5 Understand how different cultural values affect agricultural production and marketing.
A9.6 Understand how negotiations and bargaining agreements affect trade agreements.
A9.7 Analyze agricultural marketing strategies in other parts of the world.

**B. Agricultural Mechanics Pathway**

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

B1.0 Students understand personal and group safety:
B1.1 Practice the rules for personal and group safety while working in an agricultural mechanics environment.
B1.2 Know the relationship between accepted shop management procedures and a safe working environment.
B1.3 Know how to safely secure loads on a variety of vehicles.
B2.0 Students understand the principles of basic woodworking:
B2.1 Know how to identify common wood products, lumber types, and sizes.
B2.2 Know how to calculate board feet, lumber volume, and square feet.
B2.3 Know how to identify, select, and implement basic fastening systems.
B2.4 Complete a woodworking project, including interpreting a plan, developing a bill of materials and cutting list, selecting materials, shaping, joining, and finishing.
B3.0 Students understand the basic electricity principles and wiring practices commonly used
in agriculture:
B3.1 Understand the relationship between voltage, amperage, resistance, and power in single-phase alternating current (AC) circuits.

B3.2 Know how to use proper electrical test equipment for AC and direct current (DC).
B3.3 Analyze and correct basic circuit problems (e.g., open circuits, short circuits, incorrect grounding).
B3.4 Understand proper basic electrical circuit and wiring techniques with nonmetallic cable and conduit as defined by the National Electric Code.
B3.5 Interpret basic agricultural electrical plans.
B4.0 Students understand plumbing system practices commonly used in agriculture:
B4.1 Know basic plumbing fitting skills with a variety of materials, such as copper, PVC (polyvinyl chloride), steel, polyethylene, and ABS (acrylonitrile butadiene styrene).
B4.2 Understand the environmental influences on plumbing system choices (e.g., filter systems, water disposal).
B4.3 Know how various plumbing and irrigation systems are used in agriculture.
B4.4 Complete a plumbing project, including interpreting a plan, developing a bill of materials and cutting list, selecting materials, joining, and testing.
B5.0 Students understand agricultural cold metal processes:
B5.1 Know how to identify common metals, sizes, and shapes.
B5.2 Know basic tool-fitting skills.
B5.3 Know layout skills.
B5.4 Know basic cold metal processes (e.g., shearing, cutting, drilling, threading, bending.).
B5.5 Complete a cold metal project, including interpreting a plan, developing a bill of materials, selecting materials, shaping, fastening, and finishing.
B6.0 Students understand concrete and masonry practices commonly used in agriculture:
B6.1 Understand how to accurately calculate volume, materials needed, and project costs for a concrete or masonry project.
B6.2 Know proper bed preparation, concrete forms layout, and construction.
B6.3 Complete a concrete or masonry project, including developing a bill of materials, assembling, mixing, placing, and finishing.
B7.0 Students understand oxy-fuel cutting and welding:
B7.1 Understand the role of heat and oxidation in the cutting process.
B7.2 Know how to properly set up, adjust, shut down, and maintain an oxy-fuel system.
B7.3 Know how to flame-cut metal with an oxy-fuel cutting torch.
B7.4 Know how to fusion-weld mild steel with and without filler rod by using oxy-fuel equipment.
B7.5 Know basic repair skills using a variety of techniques, such as brazing or hard surfacing.
B8.0 Students understand electric arc welding processes:
B8.1 Know how to select, properly adjust, safely employ, and maintain appropriate welding equipment (e.g., gas metal arc welding, shielded metal arc welding, gas tungsten arc welding).
B8.2 Apply gas metal arc welding, shielded metal arc welding, or flux core arc welding processes to fusion-weld mild steel with appropriate welding electrodes and related equipment.

B8.3 Weld a variety of joints in various positions.
B8.4 Know how to read welding symbols and plans, select electrodes, fit-up joints, and control heat and distortion.
B9.0 Students understand advanced metallurgy principles and fabrication techniques:
B9.1 Understand metallurgy principles, including distortion, hardening, tempering, and annealing.
B9.2 Operate and maintain various arc welding and cutting systems safely and appropriately.
B9.3 Operate and maintain fabrication tools and equipment safely and appropriately.
B9.4 Understand how to design project plans by using mechanical drawing techniques.
B9.5 Understand how to finish a metal project by implementing proper sequencing.
B9.6 Know how to manipulate and finish metal by using a variety of machines and techniques (e.g., lathe, mill, CNC plasma, shears, press break).
B9.7 Construct a welding project (using any electric welding process, appropriate products, joints, and positions), including interpreting a plan, developing a bill of materials, selecting materials, and developing a clear and concise fabrication contract.
B10.0 Students understand small and compact engines:
B10.1 Understand engine theory for both two- and four-stroke cycle engines.
B10.2 Know different types of small engines and their applications.
B10.3 Know small engine parts and explain the various systems (e.g., fuel, ignition, compression, cooling, lubrication systems).
B10.4 Know how to troubleshoot and solve problems with small engines.
B10.5 Know how to disassemble, inspect, adjust, and reassemble a small engine.
B10.6 Know how to look up parts, apply repair and maintenance recommendations from a repair manual, and complete appropriate forms, including work orders.
B11.0 Students understand the principles and applications of various engines and machinery
used in agriculture:
B11.1 Understand how to identify common agricultural machinery.
B11.2 Operate and maintain equipment safely and efficiently.
B11.3 Know the various types of engines found on agricultural machinery and under stand the theory and safe operation of their systems (e.g., cooling, electrical, fuel).
B11.4 Know the theory and operation of mobile hydraulic systems and power take-off systems.
B11.5 Troubleshoot common problems with engines and agricultural equipment.
B11.6 Understand the theory and operation of 12-volt DC electronic and electrical systems (e.g., circuit design, starting, charging, and safety circuits).
B12.0 Students understand land measurement and construction techniques commonly used in
agriculture:
B12.1 Understand common surveying techniques used in agriculture (e.g., leveling, land measurement, building layout).
B12.2 Know how to draw and interpret architectural plans.
B12.3 Know how to install single- and three-phase wiring and control systems found in agricultural structures, pumps, and irrigation systems.

B12.4 Install plumbing in agricultural structures (e.g., potable water, sewer, irrigation).
B12.5 Form, place, and finish concrete or masonry (e.g., concrete block).
B12.6 Understand how to construct agricultural structures by using wood framing and steel framing systems (e.g., barns, shops, greenhouses, animal structures).
B12.7 Develop clear and concise agricultural construction contracts.

**C. Agriscience Pathway**

The Agriscience Pathway helps students acquire a broad understanding of a variety of agricultural areas, develop an awareness of the many career opportunities in agriculture, participate in occupationally relevant experiences, and work cooperatively with a group to develop and expand leadership abilities. Students study California agriculture, agricultural business, agricultural technologies, natural resources, and animal, plant, and soil sciences.
C1.0 Students understand the role of agriculture in the California economy:
C1.1 Understand the history of the agricultural industry in California.
C1.2 Understand how California agriculture affects the quality of life.
C1.3 Understand the interrelationship of California agriculture and society at the local, state, national, and international levels.
C1.4 Understand the economic impact of leading California agricultural commodities.
C1.5 Understand the economic impact of major natural resources in California.
C1.6 Know the economic importance of major agricultural exports and imports.
C2.0 Students understand the interrelationship between agriculture and the environment:
C2.1 Understand important agricultural environmental impacts on soil, water, and air.
C2.2 Understand current agricultural environmental challenges.
C2.3 Understand how natural resources are used in agriculture.
C2.4 Compare and contrast practices for conserving renewable and nonrenewable resources.
C2.5 Understand how new energy sources are developed from agricultural products (e.g., gas-cogeneration and ethanol).
C3.0 Students understand the effects of technology on agriculture:
C3.1 Understand how an agricultural commodity moves from producer to consumer.
C3.2 Understand how technology influences factors such as labor, efficiency, diversity, availability, mechanization, communication, and so forth.
C3.3 Understand public concern for technological advancements in agriculture, such as genetically modified organisms.
C3.4 Understand the laws and regulations concerning biotechnology.
C4.0 Students understand the importance of animals, the domestication of animals, and the
role of animals in modern society:
C4.1 Understand the evolution and roles of domesticated animals in society.
C4.2 Know the differences between domestication and natural selection.
C4.3 Understand the modern-day uses of animals and animal by-products.
C4.4 Understand various points of view regarding the use of animals.
C4.5 Understand unique and alternative uses of animals (e.g., Handi-Riders and companion animals).

C5.0 Students understand the cell structure and function of plants and animals:
C5.1 Understand the purpose and anatomy of cells.
C5.2 Know how cell parts function.
C5.3 Understand various cell actions, such as osmosis and cell division.
C5.4 Understand how plant and animal cells are alike and different.
C6.0 Students understand animal anatomy and systems:
C6.1 Know the names and locations of the external anatomy of animals.
C6.2 Know the anatomy and major functions of vertebrate systems, including digestive, reproductive, circulatory, nervous, muscular, skeletal, respiratory, and endocrine systems.
C7.0 Students understand basic animal genetics:
C7.1 Differentiate between genotype and phenotype, and describe how dominant and recessive genes function.
C7.2 Compare genetic characteristics among cattle, sheep, swine, and horse breeds.
C7.3 Understand how to display phenotype and genotype ratios (e.g., by using a Punnett Square).
C7.4 Understand the fertilization process.
C7.5 Understand the purpose and processes of mitosis and meiosis.
C8.0 Students understand fundamental animal nutrition and feeding:
C8.1 Know types of nutrients required by farm animals (e.g., proteins, minerals, vitamins, carbohydrates, fats/oils, water).
C8.2 Analyze suitable common feed ingredients, including forages, roughages, concentrates, and supplements, for ruminant, monogastric, equine, and avian digestive systems.
C8.3 Understand basic animal feeding guidelines and evaluate sample feeding programs for various species, including space requirements and economic considerations.
C9.0 Students understand basic animal health:
C9.1 Assess the appearance and behavior of a normal, healthy animal.
C9.2 Understand the ways in which housing, sanitation, and nutrition influence animal health and behavior.
C9.3 Understand the causes and control of common animal diseases.
C9.4 Understand how to control parasites and why.
C9.5 Understand the legal requirements for the procurement, storage, methods of application, and withdrawal times of animal medications and know proper equipment handling and disposal techniques.
C10.0 Students understand soil science principles:
C10.1 Recognize the major soil components and types.
C10.2 Understand how soil texture, structure, pH, and salinity affect plant growth.
C10.3 Understand water delivery and irrigation system options.
C10.4 Understand the types, uses, and applications of amendments and fertilizers.
C11.0 Students understand plant growth and development:
C11.1 Understand the anatomy and functions of plant systems and structures.
C11.2 Understand plant growth requirements.
C11.3 Know annual, biennial, and perennial life cycles.
C11.4 Examine plant sexual and asexual reproduction.

C11.5 Understand the photosynthesis process and the roles of the sun, chlorophyll, sugar, oxygen, carbon dioxide, and water in the process.
C11.6 Understand the respiration process in the breakdown of food and organic matter.
C12.0 Students understand fundamental pest management:
C12.1 Understand the major classifications of pests (e.g., insects, weeds, disease, vertebrate
pests).
C12.2 Understand chemical, mechanical, cultural, and biological methods of plant pest control.
C12.3 Understand the major principles, advantages, and disadvantages of integrated pest management.
C13.0 Students understand the scientific method:
C13.1 Understand the steps of the scientific method.
C13.2 Analyze an animal or plant problem and devise a solution based on the scientific method.
C13.3 Use the scientific method to conduct agricultural experiments.

**D. Animal Science Pathway**

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

D1.0 Students understand the necessary elements for proper animal housing and animal-handling equipment:
D1.1 Understand appropriate space and location requirements for habitat, housing, feed, and water.
D1.2 Understand how to select habitat and housing conditions and materials (such as indoor and outdoor housing, fencing materials, air flow/ventilation, and shelters) to meet the needs of various animal species.
D1.3 Understand the purpose and the safe and humane use of restraint equipment, such as squeeze chutes, halters, and twitches.
D1.4 Understand the purpose and the safe and humane use of animal husbandry tools, such as hoof trimmers, electric shears, elastrators, dehorning tools, and scales.
D2.0 Students understand key principles of animal nutrition:
D2.1 Understand the flow of nutrients from the soil, through the animal, and back to the soil.
D2.2 Understand the principles for providing proper balanced rations for a variety of production stages in ruminants and monogastrics.
D2.3 Understand the digestive processes of the ruminant, monogastric, avian, and equine digestive systems.
D2.4 Understand how animal nutrition is affected by the digestive, endocrine, and

circulatory systems.
D3.0 Students understand animal physiology:
D3.1 Understand the major physiological systems and the function of the organs within each system.
D3.2 Understand the animal management practices that are likely to improve the functioning of the various physiological systems.
D4.0 Students understand animal reproduction, including the function of reproductive organs:
D4.1 Understand animal conception (including estrus cycles, ovulation, and insemination).
D4.2 Understand the gestation process and basic fetal development.
D4.3 Understand the parturition process, including the identification of potential problems and their solutions.
D4.4 Understand the role of artificial insemination and embryo transfer in animal agriculture.
D4.5 Understand commonly used animal production breeding systems (e.g., purebred compared with crossbred) and reasons for their use.
D5.0 Students understand animal inheritance and selection principles, including the structure
and role of DNA:
D5.1 Evaluate a group of animals for desired qualities and discern among them for breeding selection.
D5.2 Understand how to use animal performance data in the selection and management of production animals.
D5.3 Research and discuss current technology used to measure desirable traits.
D5.4 Understand how to predict phenotypic and genotypic results of a dominant and recessive gene pair.
D5.5 Understand the role of mutations (both naturally occurring and artificially induced) and hybrids in animal genetics.
D6.0 Students understand the causes and effects of diseases and illnesses in animals:
D6.1 Understand the signs of normal health in contrast to illness and disease.
D6.2 Understand the importance of animal behavior in diagnosing animal sickness and disease.
D6.3 Understand the common pathogens, vectors, and hosts that cause disease in animals.
D6.4 Understand prevention, control, and treatment practices related to pests and parasites.
D6.5 Apply quality assurance practices to the proper administration of medicines and animal handling.
D6.6 Understand how diseases are passed among animal species and from animals to humans and how that relationship affects health and food safety.
D6.7 Understand the impacts on local, national, and global economies as well as on consumers and producers when animal diseases are not appropriately contained and eradicated.
D7.0 Students understand common rangeland management practices and their impact on a

balanced ecosystem:
D7.1 Understand the role of rangeland use in an effective animal production program.
D7.2 Know how rangeland management practices affect pasture production, erosion control, and the general balance of the ecosystem.
D7.3 Understand how to manage rangelands (including how to calculate carrying capacity) for a variety of animal species and locations.
D7.4 Understand how to balance rangeland use for animal grazing and for wildlife habitat.
D8.0 Students understand the challenges associated with animal waste management:
D8.1 Understand animal waste treatment and disposal management systems.
D8.2 Understand various methods for using animal waste and their environmental impacts.
D8.3 Understand the health and safety regulations that are an integral part of properly managed animal waste systems.
D9.0 Students understand animal welfare concerns and management practices that support
animal welfare:
D9.1 Know the early warning signs of animal distress and how to rectify the problem.
D9.2 Understand public concerns for animal welfare in the context of housing, behavior, nutrition, transportation, disposal, and harvest of animals.
D9.3 Understand federal and state animal welfare laws and regulations, such as those dealing with abandoned and neglected animals, animal fighting, euthanasia, and medical research.
D9.4 Understand the regulations for humane transport and harvest of animals, such as those delineated by the U.S. Department of Agriculture, Food Safety and Inspection Service, and the Humane Methods of Slaughter Act.
D10.0 Students understand the production of large animals (e.g., cattle, horses, swine, sheep,
goats) and small animals (e.g., poultry, cavy, rabbits):
D10.1 Know how to synthesize and implement optimum requirements for diet, genetics, habitat, and behavior in the production of large and small animals.
D10.2 Understand how to develop, maintain, and use growth and management records for large or small animals.
D11.0 Students understand the production of specialty animals (e.g., fish, marine animals,
llamas, tall flightless birds):
D11.1 Understand the specialty animal's role in agriculture (e.g., fish farms, pack animals, working dogs).
D11.2 Understand the unique nutrition, health, and habitat requirements for specialty animals.
D11.3 Know how to synthesize and implement optimum requirements for diet, genetics, habitat, and behavior in the production of specialty animals.
D11.4 Understand how to develop, maintain, and use growth and management records for specialty animals.
D12.0 Students understand how animal products and by-products are processed and marketed:

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

**E. Forestry and Natural Resources Pathway**

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

E1.0 Students understand the importance of energy and energy cycles:
E1.1 Understand the oxygen, carbon, nitrogen, and water cycles.
E1.2 Understand the difference between renewable and nonrenewable energy sources.
E1.3 Understand the difference between natural resource management conservation strategies and preservation strategies.
E1.4 Compare the effects on air and water quality of using different forms of energy.
E1.5 Analyze the way in which human activities influence energy cycles and natural resource management.
E2.0 Students understand air and water use, management practices, and conservation strategies:
E2.1 Understand the government's role in regulating air, soil, and water use management practices and conservation strategies.
E2.2 Understand air and water conservation issues.
E2.3 Understand appropriate water conservation measures.
E2.4 Understand the component of a plan that monitors water quality.
E2.5 Understand the component of a plan that monitors air quality.
E2.6 Analyze the way in which water management affects the environment and human needs.
E3.0 Students understand soil composition and soil management:
E3.1 Understand the systems used to classify soils.
E3.2 Understand the reasons for and importance of soil conservation.
E3.3 Understand how to analyze soils found in the different natural resource management areas.
E3.4 Understand how to develop and implement a soil management plan for a natural resource management area.

E3.5 Understand how to analyze existing soil surveys to develop effective management plans.
E4.0 Students understand rangeland management:
E4.1 Know the locations of major U.S. and California rangeland areas.
E4.2 Understand the interrelationship of rangeland management, the environment, wildlife management, and the livestock industry.
E4.3 Understand practices used to improve rangeland quality.
E4.4 Analyze the carrying capacity in various rangelands for both wildlife species and domestic livestock.
E4.5 Distinguish among different browse and forage species in California rangelands.
E4.6 Understand the components of a rangeland monitoring plan.
E4.7 Understand the requirements and rights accompanying public land grazing permits and the government agencies involved (e.g., Bureau of Land Management and U.S. Forest Service).
E5.0 Students understand wildlife management and habitat:
E5.1 Understand the relationship between habitat and wildlife population.
E5.2 Understand habitat requirements for different species and identify factors that influence population dynamics.
E5.3 Understand the methods for determining existing wildlife species populations.
E5.4 Understand mammalian and avian reproductive processes and explain how nutrition and habitat affect reproduction and population.
E5.5 Understand a variety of management practices used to manage wildlife populations for hunting and other recreational purposes.
E5.6 Analyze the economic and environmental significance of sport hunting and fishing industries.
E5.7 Understand the purpose, history, terminology, and challenges of the Endangered Species Act and current activities related to the Act.
E6.0 Students understand aquatic resource use and management:
E6.1 Understand the different types of aquatic resources.
E6.2 Know the major body parts, digestive systems, and reproductive organs of aquatic species.
E6.3 Understand a variety of methods to determine the populations of existing aquatic species.
E6.4 Analyze the relationship between water quality and aquatic species habitat.
E6.5 Understand a variety of management practices for managing aquatic species for sport fishing and other purposes.
E6.6 Understand how to make financial and production decisions and maintain growth and management records for a selected aquatic species.
E7.0 Students understand the outdoor recreation industry:
E7.1 Understand the potential environmental impacts of recreational activities and how to manage the resources affected.
E7.2 Understand basic survival skills and first-aid procedures.
E7.3 Understand appropriate trail construction and maintenance techniques.
E7.4 Understand how to select appropriate recreational gear for trips of varying types and durations and how to use it safely and appropriately (for minimum environmental impact).

E7.5 Know how to set up a campsite for minimum environmental impact.
E8.0 Students understand basic plant physiology, anatomy, and taxonomy:
E8.1 Understand the scientific method of animal classification, including order, family, genus, and species.
E8.2 Know how to use a dichotomous key to identify plants and animals.
E8.3 Know how to identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
E8.4 Recognize the factors that influence plant growth, such as respiration, temperature, nutrients, and photosynthesis.
E9.0 Students understand the role of fire in natural resource management:
E9.1 Understand the role of fire in forest and rangeland ecosystems.
E9.2 Understand the significance of each of the components of the "fire triangle."
E9.3 Know appropriate wildland fire-suppression practices.
E9.4 Understand the components of a fire-control plan.
E9.5 Know how to use fire-control tools safely.
E9.6 Know the training requirements for fire-suppression certification.
E10.0 Students understand forest management practices:
E10.1 Understand how social, political, and economic factors can affect the use of forests.
E10.2 Understand the California Forest Practice Act and the requirements for Timber Harvest and Habitat Conservation Plans.
E10.3 Analyze forest management systems (e.g., sustained yield, watershed management, ecosystem management, multiple-use management).
E10.4 Analyze harvest and renewability (e.g., re-seeding and thinning) systems and identify the impact of each on the land.
E10.5 Understand Silvicultural systems and skills, including appropriate tool use.
E10.6 Understand how to identify and diagnose damage from destructive insects, diseases, and weather, and know methods for their management.
E11.0 Students understand the basic concepts of measurement, surveying, and mapping:
E11.1 Understand the Public Land Survey System.
E11.2 Use surveying equipment, including global positioning satellites, maps, and a compass to determine area, boundaries, and elevation differences.
E11.3 Know how to apply timber-cruising and log-scaling skills to determine timber and log volume for management and marketing.
E11.4 Understand how to create a management plan map that includes layer information and data points from global information systems.
E12.0 Students understand the use, processing, and marketing of products from natural resource
industries:
E12.1 Know the marketing processes and manufacturing standards for a variety of natural resource products, including mining, quarrying, and drilling.
E12.2 Know how to manufacture a product (to manufacturing standards) from a natural resource.
E12.3 Analyze the production of specialty and seasonal products from natural resources.
E12.4 Know different wood types and their uses.
E12.5 Know lumber manufacturing processes.

E13.0 Students understand public and private land issues:
E13.1 Understand the differences between publicly and privately held lands.
E13.2 Understand the differences between public land designations (e.g., State Park, National Forest, wilderness areas, wild and scenic areas).
E13.3 Understand the role of public and private property rights and how they affect agriculture.
E13.4 Understand the role of government in managing public and private property rights.

## F. Ornamental Horticulture Pathway

The Ornamental Horticulture Pathway prepares students for careers in the nursery, landscaping, and floral industries. Topics include plant identification, plant physiology, soil science, plant reproduction, nursery production, and floriculture as well as landscaping
design, installation, and maintenance.
F1.0 Students understand plant classification and use principles:
F1.1 Understand how to classify and identify plants by order, family, genus, and species.
F1.2 Understand how to identify plants by using a dichotomous key.
F1.3 Understand how common plant parts are used to classify the plants.
F1.4 Understand how to classify and identify plants by using botanical growth habits, landscape uses, and cultural requirements.
F1.5 Understand plant selection and identification for local landscape applications.
F2.0 Students understand plant physiology and growth principles:
F2.1 Understand plant systems, nutrient transportation, structure, and energy storage.
F2.2 Understand the seed's essential parts and functions.
F2.3 Understand how primary, secondary, and trace elements are used in plant growth.
F2.4 Understand the factors that influence plant growth, including water, nutrients, light, soil, air, and climate.
F2.5 Understand the tissues seen in a cross section of woody and herbaceous plants.
F2.6 Understand the factors that affect plant growth.
F3.0 Students understand sexual and asexual plant reproduction:
F3.1 Understand the different forms of sexual and asexual plant reproduction.
F3.2 Understand the various techniques for successful plant propagation (e.g., budding, grafting, cuttings, seeds).
F3.3 Understand how to monitor plant reproduction for the development of a saleable product.
F4.0 Students understand basic integrated pest management principles:
F4.1 Read and interpret pesticide labels and understand safe pesticide management practices.
F4.2 Understand how pesticide regulations and government agencies affect agriculture.
F4.3 Understand common horticultural pests and diseases and methods of controlling them.
F4.4 Understand the systematic approach to solving plant problems.

F5.0 Students understand water and soil (media) management practices:
F5.1 Understand how basic soil science and water principles affect plant growth.
F5.2 Know basic irrigation design and installation methods.
F5.3 Prepare and amend soils, implement soil conservation methods, and compare results.
F5.4 Understand major issues related to water sources and water quality.
F5.5 Know the components of soilless media and the use of those media in various types of containers.
F6.0 Students understand ornamental plant nutrition practices:
F6.1 Analyze how primary and secondary nutrients and trace elements affect ornamental plants.
F6.2 Understand basic nutrient testing procedures on soil and plant tissue.
F6.3 Analyze organic and inorganic fertilizers to understand their appropriate uses.
F6.4 Understand how to read and interpret labels to properly apply fertilizers.
F7.0 Students understand the selection, installation, and maintenance of turf:
F7.1 Understand the selection and management of landscape and sports field turf.
F7.2 Understand how to select, install, and maintain a designated turfgrass area.
F7.3 Understand how the use of turf benefits the environment.
F8.0 Students understand nursery production principles:
F8.1 Understand how to properly use production facilities and common nursery equipment.
F8.2 Understand common nursery production practices.
F8.3 Understand how to propagate and maintain a horticultural crop to the point of sale.
F8.4 Understand marketing and merchandising principles used in nursery production.
F9.0 Students understand the use of containers and horticultural tools, equipment, and facilities:
F9.1 Understand the use of different types of containers and demonstrate how to maintain growing containers in controlled environments.
F9.2 Operate and maintain selected hand and power equipment safely and appropriately.
F9.3 Select proper tools for specific horticultural jobs.
F9.4 Understand how to install landscape components and electrical land and water features.
F10.0 Students understand basic landscape planning, design, construction, and maintenance:
F10.1 Know the terms associated with landscape and design and their appropriate use.
F10.2 Understand the principles of residential design, including how to render design to scale.
F10.3 Understand proper landscape planting and maintenance practices.
F10.4 Prune ornamental shrubs, trees, and fruit trees.
F10.5 Develop clear and concise landscape business contracts.
F11.0 Students understand basic floral design principles:
F11.1 Understand the use of plant materials and tools.
F11.2 Apply basic design principles to products and designs.
F11.3 Handle, prepare, and arrange cut flowers appropriately.
F11.4 Understand marketing and merchandising principles used in the floral industry.

**G. Plant and Soil Science Pathway**

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

G1.0 Students understand plant classification principles:

G1.1 Understand how to classify and identify plants by order, family, genus, and species.

G1.2 Understand how to identify plants by using a dichotomous key.

G1.3 Understand how common plant parts are used to classify the plants.

G1.4 Understand the differences between and uses of native and nonnative plants.

G1.5 Understand the differences between monocots and dicots.

G1.6 Understand the differences between plants under production and weeds.

G2.0 Students understand cell biology:

G2.1 Understand the differences between prokaryotic cells and plant and animal eukaryotic cells and how viruses differ from them in complexity and general structure.

G2.2 Understand plant cellular function reactions when plants are grown under different conditions.

G2.3 Understand what functions organelles play in the health of the cell.

G2.4 Understand the part of the cell that is responsible for the genetic information that controls plant growth and development.

G2.5 Understand plant inheritance principles, including the structure and role of DNA.

G2.6 Understand which organelles in plant cells carry out photosynthesis.

G3.0 Students understand plant physiology and growth principles:

G3.1 Understand plant systems, nutrient transportation, structure, and energy storage.

G3.2 Understand the seed’s essential parts and functions.

G3.3 Understand how primary, secondary, and trace elements are used in plant growth.

G3.4 Understand the factors that influence plant growth, including water, nutrients, light, soil, air, and climate.

G3.5 Understand the tissues seen in a cross section of woody and herbaceous plants.

G3.6 Understand the factors that affect plant growth and predict plant response.

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

G4.1 Understand the different forms of sexual and asexual plant reproduction.

G4.2 Understand the various techniques for successful plant propagation (e.g., budding, grafting, cuttings, and seeds).

G4.3 Understand the proper sterile technique used in tissue culture.

G5.0 Students understand pest problems and management:

G5.1 Understand how to categorize insects as pests, beneficial, or neutral and their roles.

G5.2 Understand the role of other pests, such as nematodes, molds, mildews, and

weeds.
G5.3 Know conventional, sustainable, and organic management methods to prevent or treat plant disease symptoms.
G5.4 Understand integrated pest management to prevent, treat, and control plant disease symptoms (including conventional, sustainable, and organic management methods).
G5.5 Understand how biotechnology can be used to manage pests.
G6.0 Students understand soils and plant production:
G6.1 Understand soil types, soil texture, structure, and bulk density and explain the U.S. Department of Agriculture (USDA) soil-quality rating procedure.
G6.2 Understand soil properties necessary for successful plant production, including pH, EC, and essential nutrients.
G6.3 Understand soil biology and diagram the soil food chain.
G6.4 Understand how soil biology affects the environment and natural resources.
G7.0 Students understand effective tillage and soil conservation management practices:
G7.1 Understand how to effectively manage and conserve soil through conventional, minimum, conservation, and no-tillage irrigation and through drainage and tillage practices.
G7.2 Understand how global positioning systems, surveying, laser leveling, and other tillage practices conserve soil.
G7.3 Use tools such as the USDA and the local Resource Conservation District soil survey maps to determine appropriate soil management practices.
G8.0 Students understand effective water management practices:
G8.1 Understand California water history, current issues, water rights, water law, and water transfer through different distribution projects throughout the state.
G8.2 Understand the local, state, and federal agencies that regulate water quality and availability in California.
G8.3 Understand the definition of a watershed and how it is used to measure water quality.
G8.4 Understand effective water management and conservation practices, including the use of tailwater ponds.
G8.5 Know water-testing standards and perform bioassay and macro-invertebrate protocols to assess water quality.
G9.0 Students understand the concept of an "agrosystem" approach to production:
G9.1 Understand how to identify and classify the plants and animals in an agricultural system (as producers, consumers, or decomposers).
G9.2 Understand the elements of conventional, sustainable, and organic production systems.
G9.3 Understand the components of "whole-system management."
G10.0 Students understand local crop management and production practices:
G10.1 Understand local cultural techniques, including monitoring, pruning, fertilization, planting, irrigation, harvest treatments, processing, and packaging practices for various tree, grain, hay, and vegetable classes.
G10.2 Understand common marketing and shipping characteristics of local commodities.
G10.3 Understand general maturity and harvest-time guidelines for specific local plant products.

G11.0 Students understand plant biotechnology:
G11.1 Understand how changing technology—such as micropropagation, biological pest controls, and genetic engineering (including DNA extraction and gel electrophoresis)—
affects plant production, yields, and management.
G11.2 Understand the various technology advancements that affect plant and soil science (such as global positioning systems, global information systems, variable rate technology, and remote sensing).
G11.3 Know how herbicide-resistant plant genes can affect the environment.
G11.4 Understand how genetic engineering techniques have been used to improve crop yields.
G11.5 Understand the effects of agricultural biotechnology, including genetically modified organisms, on the agriculture industry and the larger society and the pros and cons of such use.

Every teacher had their own copy of the Literacy Standards and ELD Standards

## 9th and 10th grade

| | ELA Literature | ELA Informational Text | History/Social Studies | Science/Technical Subjects | Writing | Writing in History, Social Studies, Science, & Technical Subjects |
|---|---|---|---|---|---|---|
| | Key Ideas and Details: | Key Ideas and Details: | Key Ideas and Details: | Key Ideas and Details: | Text Types and Purposes: | Text Types and Purposes: |
| Standard 1 | Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. | Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. | Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information. | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. | Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. (see substandards A-E as well). | Write arguments focused on discipline-specific content. (see substandards A-E as well). |
| Standard 2 | Determine a theme or central idea of a text and analyze in detail 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. | 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. | Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text. | 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. | 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. (see substandards A-E as well). | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (see substandard A-E as well). |
| Standard 3 | Analyze how complex characters (e.g., those with multiple or conflicting motivations) develop over the course of a text, interact with other characters, and advance the plot or develop the theme. | 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. | Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them. | 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. | Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. (see substandards A-E as well). | (not applicable as a separate requirement) |
| | Craft and Structure: | Craft and Structure: | Craft and Structure: | Craft and Structure: | Production and Distribution of Writing: | Production and Distribution of Writing: |
| Standard 4 | Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone). | 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). | Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science. | 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. | 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.) | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| Standard 5 | Analyze how an author's choices concerning how to structure a text, order events within it (e.g., parallel plots), and manipulate time (e.g., pacing, flashbacks) create such effects as mystery, tension, or surprise. | Analyze in detail how an author's ideas or claims are developed and refined by particular sentences, paragraphs, or larger portions of a text (e.g., a section or chapter). | Analyze how a text uses structure to emphasize key points or advance an explanation or analysis | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). | 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 9-10 here.) | 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. |

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|---|---|---|---|---|---|---|
| | Craft and Structure: | Craft and Structure: | Craft and Structure: | Craft and Structure: | Production and Distribution of Writing: | Production and Distribution of Writing: |
| Standard 6 | Analyze a particular point of view or cultural experience reflected in a work of literature from outside the United States, drawing on a wide reading of world literature. | Determine an author's point of view or purpose in a text and analyze how an author uses rhetoric to advance that point of view or purpose. | Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts. | 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. | 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. | 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. |
| | Integration of Knowledge and Idea | Integration of Knowledge an | Integration of Knowledge | Integration of Knowledge and | Research to Build and Present Knowledge: | Research to Build and Present Knowledge: |
| Standard 7 | Analyze the representation of a subject or a key scene in two different artistic mediums, including what is emphasized or absent in each treatment (e.g., Auden's "Musée des Beaux Arts" and Breughel's Landscape with the Fall of Icarus). | 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. | Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text. | 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. | 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. | 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. |
| Standard 8 | (RL 9-10.8 not applicable to literature) | 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. | Assess the extent to which the reasoning and evidence in a text support the author's claims. | 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. | 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. | 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. |
| Standard 9 | Analyze how an author draws on and transforms source material in a specific work (e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare). | Analyze seminal U.S. documents of historical and literary significance (e.g., Washington's Farewell Address, the Gettysburg Address, Roosevelt's Four Freedoms speech, King's "Letter from Birmingham Jail"), including how they address related themes and concepts. | Compare and contrast treatments of the same topic in several primary and secondary sources. | 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. | Draw evidence from literary or informational texts to support analysis, reflection, and research. (See substandards A & B as well). | Draw evidence from informational texts to support analysis, reflection, and research. |
| | Range of Reading & Level of Text Complexity | Range of Reading & Level of Text Complexity | Range of Reading & Level of Text Complexity | Range of Reading & Level of Text Complexity | Range of Writing: | Range of Writing: |
| Standard 10 | By the end of grade 9, read and comprehend literature, including stories, dramas, and poems, 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 literature, including stories, dramas, and poems, at the high end of the grades 9-10 text complexity band independently and proficiently. | By the end of grade 9, read and comprehend literacy 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. | By the end of grade 10, read and comprehend history/social studies texts in the grades 9-10 text complexity band independently and proficiently. | By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. | 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. | 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. |

# 11th and 12th grade

| | ELA Literature | ELA Informational Text | History/Social Studies | Science/Technical Subject | Writing | Writing in History, Social Studies, Science, & Technical Subjects |
|---|---|---|---|---|---|---|
| | Key Ideas and Details: | Key Ideas and Details: | Key Ideas and Details: | Key Ideas and Details: | Text Types and Purposes: | Text Types and Purposes: |
| Standard 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. | 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. | Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole. | 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. | Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. (see substandards A-E as well) | Write arguments focused on discipline-specific content. (see substandards A-E as well) |
| Standard 2 | Determine two or more themes or 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 produce a complex account; provide an objective summary of the text. | 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. | Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas. | 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. | 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. (See substandards A-E as well) | Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (see substandards A-E as well) |
| Standard 3 | Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters are introduced and developed). | 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. | Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain. | 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. | Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. (See substandard A-E as well) | (See note; not applicable as a separate requirement) |
| | Craft and Structure: | Craft and Structure: | Craft and Structure: | Craft and Structure: | Production and Distribution of Writing: | Production and Distribution of Writing: |
| Standard 4 | Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (Include Shakespeare as well as other authors.) | 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). | Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines faction in Federalist No. 10). | 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. | 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.) | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| Standard 5 | Analyze how an author's choices concerning how to structure specific parts of a text (e.g., the choice of where to begin or end a story, the choice to provide a comedic or tragic resolution) contribute to its overall structure and meaning as well as its aesthetic impact. | Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging. | Analyze in detail how a complex primary source is structured, including how key sentences, paragraphs, and larger portions of the text contribute to the whole. | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. | 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 here.) | 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. |
| | Craft and Structure: | Craft and Structure: | Craft and Structure: | Craft and Structure: | Production and Distribution of Writing: | Production and Distribution of Writing: |
| Standard 6 | Analyze a case in which grasping a point of view requires distinguishing what is directly stated in a text from what is really meant (e.g., satire, sarcasm, irony, or understatement). | Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text. | Evaluate authors' differing points of view on the same historical event or issue by assessing the authors' claims, reasoning, and evidence. | 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. | 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. | 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. |
| | Integration of Knowledge and Ideas: | Integration of Knowledge and Ideas: | Integration of Knowledge and Ideas: | Integration of Knowledge and Ideas: | Research to Build and Present Knowledge: | Research to Build and Present Knowledge: |
| Standard 7 | Analyze multiple interpretations of a story, drama, or poem (e.g., recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.) | 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. | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem. | 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. | 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. | 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. |
| Standard 8 | (RL.11-12.8 not applicable to literature) | 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). | Evaluate an author's premises, claims, and evidence by corroborating or challenging them with other information. | 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. | 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 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. | 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. |
| Standard 9 | Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics. | Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including The Declaration of Independence, the Preamble to the Constitution, the Bill of Rights, and Lincoln's Second Inaugural Address) for their themes, purposes, and rhetorical features. | Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources. | 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. | Draw evidence from literary or informational texts to support analysis, reflection, and research. (See substandard A & B as well) | Draw evidence from informational texts to support analysis, reflection, and research. |
| | Range of Reading & Level of Text Complexity | Range of Reading & Level of Text Complexity | Range of Reading & Level of Text Complexity | Range of Reading & Level of Text Complexity | Range of Writing | Range of Writing |
| Standard 10 | By the end of grade 11, read and comprehend literature, including stories, dramas, and poems, 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 literature, including stories, dramas, and poems, at the high end of the grades 11-CCR text complexity band independently and proficiently. | 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. | By the end of grade 12, read and comprehend history/social studies texts in the grades 11-CCR text complexity band independently and proficiently. | By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently. | 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. | 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. |

## ELD STANDARDS GRADES 9-10

### Part I: Interacting in Meaningful Ways

| | | Emerging | Expanding | Bridging |
|---|---|---|---|---|
| Collaborative | ***Exchanging information/ ideas*** | Engage in conversational exchanges and express ideas on familiar current events and academic topics by asking and answering yes-no questions and wh-questions and responding using phrases and short sentences. | Contribute to class, group, and partner discussions, sustaining conversations on a variety of age and grade-appropriate academic topics by following turn-taking rules, asking and answering relevant, on-topic questions, affirming others, providing additional, relevant information, and paraphrasing key ideas. | Contribute to class, group, and partner discussions, sustaining conversations on a variety of age and grade-appropriate academic topics by following turn-taking rules, asking and answering relevant, on-topic questions, affirming others, and providing coherent and well-articulated comments and additional information. |
| Collaborative | ***Interacting via written English*** | Engage in short, grade-appropriate written exchanges and writing projects, using technology as appropriate. | Collaborate with peers to engage in increasingly complex grade-appropriate written exchanges and writing projects, using technology as appropriate. | Collaborate with peers to engage in a variety of extended written exchanges and complex grade-appropriate writing projects, using technology as appropriate. |
| Collaborative | ***Supporting opinions and persuading others*** | Negotiate with or persuade others in conversations using learned phrases (e.g., Would you say that again? I think . . .), as well as open responses to express and defend opinions. | Negotiate with or persuade others in conversations (e.g., to provide counterarguments) using a growing number of learned phrases (I see your point, but . . .) and open responses to express and defend nuanced opinions. | Negotiate with or persuade others (e.g., in conversations in appropriate registers (e.g., to acknowledge new information in an academic conversation but then politely offer a counterpoint) using a variety of learned phrases, indirect reported speech (e.g., I heard you say X, and I haven't thought about that before. However . . .), and open responses to express and defend nuanced opinions. |
| Collaborative | ***Adapting language choices*** | Adjust language choices according to the context (e.g., classroom, community) and audience (e.g., peers, teachers). | Adjust language choices according to the context (e.g., classroom, community), purpose (e.g., to persuade, to provide arguments or counterarguments), task, and audience (e.g., peers, teachers, guest lecturer). | Adjust language choices according to the task (e.g., group presentation of research project), context (e.g., classroom, community), purpose (e.g., to persuade, to provide arguments or counterarguments), and audience (e.g., peers, teachers, college recruiter). |
| Interpretive | ***Listening Actively*** | Demonstrate comprehension of oral presentations and discussions on familiar social and academic topics by asking and answering questions, with prompting and substantial support. | Demonstrate comprehension of oral presentations and discussions on a variety of social and academic topics by asking and answering questions that show thoughtful consideration of the ideas or arguments, with moderate support. | Demonstrate comprehension of oral presentations and discussions on a variety of social and academic topics by asking and answering detailed and complex questions that show thoughtful consideration of the ideas or arguments, with light support. |
| Interpretive | ***Reading/Viewing Closely*** | A. Explain ideas, phenomena, processes, and text relationships (e.g., compare/ contrast, cause/effect, evidence-based argument) based on close reading of a variety of grade-appropriate texts, presented in various print and multimedia formats, using short sentences and a select set of general academic and domain-specific words. B. Explain inferences and conclusions drawn from close reading of gradeappropriate texts and viewing of multimedia using familiar verbs (e.g., seems that). C. Use knowledge of morphology (e.g., common prefixes and suffixes), context, reference materials, and visual cues to determine the meaning of unknown and multiple-meaning words on familiar topics. | a. Explain ideas, phenomena, processes, and relationships within and across texts (e.g., compare/contrast, cause/effect, themes, evidence-based argument) based on close reading of a variety of gradeappropriate texts, presented in various print and multimedia formats, using increasingly detailed sentences, and an increasing variety of general academic and domainspecific words. b. Explain inferences and conclusions drawn from close reading of grade-appropriate texts and viewing of multimedia using an increasing variety of verbs and adverbials (e.g., indicates that, suggests, as a result). c. Use knowledge of morphology (e.g., affixes, Greek and Latin roots), context, reference materials, and visual cues to determine the meaning of unknown and multiple-meaning words on familiar and new topics. | a. Explain ideas, phenomena, processes, and relationships within and across texts (e.g., compare/contrast, cause/effect, themes, evidence-based argument) based on close reading of a variety of grade-level texts, presented in various print and multimedia formats, using a variety of detailed sentences and a range of general academic and domain-specific words. b. Explain inferences and conclusions drawn from close reading of grade-level texts and viewing of multimedia using a variety of verbs and adverbials (e.g., creates the impression that, consequently). c. Use knowledge of morphology (e.g., derivational suffixes), context, reference materials, and visual cues to determine the meaning, including figurative and connotative meanings, of unknown and multiple-meaning words on a variety of new topics. |
| Interpretive | ***Evaluating Language Choices*** | Explain how successfully writers and speakers structure texts and use language (e.g., specific word or phrasing choices) to persuade the reader (e.g., by providing evidence to support claims or connecting points in an argument) or create other specific effects, with substantial support. | Explain how successfully writers and speakers structure texts and use language (e.g., specific word or phrasing choices) to persuade the reader (e.g., by providing well-worded evidence to support claims or connecting points in an argument in specific ways) or create other specific effects, with moderate support. | Explain how successfully writers and speakers structure texts and use language (e.g., specific word or phrasing choices) to persuade the reader (e.g., by providing well-worded evidence to support claims or connecting points in an argument in specific ways) or create other specific effects, with light support. |
| Interpretive | ***Analyzing Language Choices*** | Explain how a writer's or speaker's choice of phrasing or specific words (e.g., describing a character or action as aggressive versus bold) produces nuances and different effects on the audience. | Explain how a writer's or speaker's choice of phrasing or specific words (e.g., using figurative language or words with multiple meanings to describe an event or character) produces nuances and different effects on the audience. | Explain how a writer's or speaker's choice of a variety of different types of phrasing or words (e.g., hyperbole, varying connotations, the cumulative impact of word choices) produces nuances and different effects on the audience. |
| Productive | ***Presenting*** | Plan and deliver brief oral presentations and reports on grade-appropriate topics that present evidence and facts to support ideas. | Plan and deliver a variety of oral presentations and reports on grade-appropriate topics that present evidence and facts to support ideas by using growing understanding of register. | Plan and deliver a variety of oral presentations and reports on grade-appropriate topics that express complex and abstract ideas well supported by evidence and sound reasoning, and are delivered using an appropriate level of formality and understanding of register. |
| Productive | ***Writing*** | a. Write short literary and informational texts (e.g., an argument about water rights) collaboratively (e.g., with peers) and independently. b. Write brief summaries of texts and experiences by using complete sentences and key words (e.g., from notes or graphic organizers). | a. Write longer literary and informational texts (e.g., an argument about water rights) collaboratively (e.g., with peers) and independently by using appropriate text organization and growing understanding of register. b. Write increasingly concise summaries of texts and experiences by using complete sentences and key words (e.g., from notes or graphic organizers). | a. Write longer and more detailed literary and informational texts (e.g., an argument about water rights) collaboratively (e.g., with peers) and independently using appropriate text organization and register. b. Write clear and coherent summaries of texts and experiences by using complete and concise sentences and key words (e.g., from notes or graphic organizers). |

| | | Emerging | Expanding | Bridging |
|---|---|---|---|---|
| *Productive* | ***Justifying/ Arguing*** | a. Justify opinions by articulating some relevant textual evidence or background knowledge, with visual support. b. Express attitude and opinions or temper statements with familiar modal expressions (e.g., can, may). | a. Justify opinions and positions or persuade others by making connections between ideas and articulating relevant textual evidence or background knowledge. b. Express attitude and opinions or temper statements with a variety of familiar modal expressions (e.g., possibly/likely, could/ would). | a. Justify opinions or persuade others by making connections and distinctions between ideas and texts and articulating sufficient, detailed, and relevant textual evidence or background knowledge, using appropriate register. b. Express attitude and opinions or temper statements with nuanced modal expressions (e.g., possibly/ potentially/ certainly/ absolutely, should/might) |
| *Productive* | ***Selecting Language Resources*** | a. Use familiar general academic (e.g., temperature, document) and domain-specific (e.g., characterization, photosynthesis, society, quadratic functions) words to create clear spoken and written texts. b. Use knowledge of morphology to appropriately select basic affixes (e.g., The skull protects the brain) | a. Use an increasing variety of gradeappropriate general academic (e.g., dominate, environment) and domain-specific (e.g., characterization, photosynthesis, society, quadratic functions) academic words accurately and appropriately when producing increasingly complex written and spoken texts. b. Use knowledge of morphology to appropriately select affixes in a growing number of ways to manipulate language (e.g., Repairable, stems are branched or unbranched | a. Use a variety of grade-appropriate general (e.g., anticipate, transaction) and domain-specific (e.g., characterization, photosynthesis, society, quadratic functions) academic words and phrases, including persuasive language, accurately and appropriately when producing complex written and spoken texts. b. Use knowledge of morphology to appropriately select affixes in a variety of ways to manipulate language (e.g., changing humiliate to humiliation or incredible to incredibly). |

### Part II: Learning About How English Works

| | | Emerging | Expanding | Bridging |
|---|---|---|---|---|
| *Structuring Cohesive Texts* | ***Understanding Text Structure*** | Apply analysis of the organizational structure of different text types (e.g., how arguments are organized by establishing clear relationships among claims, counterclaims, reasons, and evidence) to comprehending texts and to writing brief arguments, informative/explanatory texts and narratives. | Apply analysis of the organizational structure of different text types (e.g., how arguments are organized by establishing clear relationships among claims, counterclaims, reasons, and evidence) to comprehending texts and to writing increasingly clear and cohesive arguments, informative/ explanatory texts and narratives | Apply analysis of the organizational structure of different text types (e.g., how arguments are organized by establishing clear relationships among claims, counterclaims, reasons, and evidence) to comprehending texts and to writing clear and cohesive arguments, informative/explanatory texts and narratives. |
| *Structuring Cohesive Texts* | ***Understanding Cohesion*** | a. Apply knowledge of familiar language resources for referring to make texts more cohesive (e.g., using pronouns to refer back to nouns in text) to comprehending and writing brief texts. b. Apply knowledge of familiar language resources for linking ideas, events, or reasons throughout a text (e.g., using connecting/transition words and phrases, such as first, second, third) to comprehending and writing brief texts. | a. Apply knowledge of a growing number of language resources for referring to make texts more cohesive (e.g., using nominalizations to refer back to an action or activity described earlier) to comprehending texts and to writing increasingly cohesive texts for specific purposes and audiences. b. Apply knowledge of familiar language resources for linking ideas, events, or reasons throughout a text (e.g., using connecting/transition words and phrases, such as meanwhile, however, on the other hand) to comprehending texts and to writing increasingly cohesive texts for specific purposes and audiences. | a. Apply knowledge of a variety of language resources for referring to make texts more cohesive (e.g., using nominalization, paraphrasing, or summaries to reference or recap an idea or explanation provided earlier) to comprehending grade-level texts and to writing clear and cohesive grade-level texts for specific purposes and audiences. b. Apply knowledge of familiar language resources for linking ideas, events, or reasons throughout a text (e.g., using connecting/transition words and phrases, such as on the contrary, in addition, moreover) to comprehending grade-level texts and to writing cohesive texts for specific purposes and audiences. |
| *Expanding and Enriching Ideas* | ***Using Verbs and Verb Phrases*** | Use a variety of verbs in different tenses (e.g., past, present, future, simple, progressive) appropriate to the text type and discipline to create short texts on familiar academic topics. | Use a variety of verbs in different tenses (e.g., past, present, future, simple, progressive, perfect) appropriate to the text type and discipline to create a variety of texts that explain, describe, and summarize concrete and abstract thoughts and ideas. | Use a variety of verbs in different tenses (e.g., past, present, future, simple, progressive, perfect), and mood (e.g., subjunctive) appropriate to the text type and discipline to create a variety of texts that describe concrete and abstract ideas, explain procedures and sequences, summarize texts and ideas, and present and critique points of view |
| *Expanding and Enriching Ideas* | ***Using Nouns and Noun Phrases*** | Expand noun phrases to create increasingly detailed sentences (e.g., adding adjectives for precision) about personal and familiar academic topics. | Expand noun phrases in a growing number of ways (e.g., adding adjectives to nouns, simple clause embedding) to create detailed sentences that accurately describe, explain, and summarize information and ideas on a variety of personal and academic topics. | Expand noun phrases in a variety of ways (e.g., more complex clause embedding) to create detailed sentences that accurately describe concrete and abstract ideas, explain procedures and sequences, summarize texts and ideas, and present and critique points of view on a variety of academic topics. |
| *Expanding and Enriching Ideas* | ***Modifying to Add Details*** | Expand sentences with simple adverbials (e.g., adverbs, adverb phrases, prepositional phrases) to provide details (e.g., time, manner, place, cause) about familiar activities or processes. | Expand sentences with a growing variety of adverbials (e.g., adverbs, adverb phrases, prepositional phrases) to provide details (e.g., time, manner, place, cause) about familiar or new activities or processes. | Expand sentences with a variety of adverbials (e.g., adverbs, adverb phrases and clauses, prepositional phrases) to provide details (e.g., time, manner, place, cause) about a variety of familiar and new activities and processes. |
| *Connecting and Condensing Ideas* | ***Connecting Ideas*** | Combine clauses in a few basic ways (e.g., creating compound sentences using and, but, so; creating complex sentences using because) to make connections between and to join ideas (e.g., I want to read this book because it describes the solar system). | Combine clauses in a growing number of ways to create compound and complex sentences that make connections between and link concrete and abstract ideas, for example, to express a reason (e.g., He stayed at home on Sunday in order to study for Monday's exam) or to make a concession (e.g., She studied all night even though she wasn't feeling well). | Combine clauses in a variety of ways to create compound and complex sentences that make connections between and link concrete and abstract ideas, for example, to make a concession (e.g., While both characters strive for success, they each take different approaches through which to reach their goals.), or to establish cause (e.g., Women's lives were changed forever after World War II as a result of joining the workforce). |
| *Connecting and Condensing Ideas* | ***Condensing Ideas*** | Condense ideas in a few basic ways (e.g., by compounding verb or prepositional phrases) to create precise and detailed simple, compound, and complex sentences (e.g., The students asked survey questions and recorded the responses). | Condense ideas in a growing number of ways (e.g., through embedded clauses or by compounding verbs or prepositional phrases) to create more precise and detailed simple, compound, and complex sentences (e.g., Species that could not adapt to the changing climate eventually disappeared). | Condense ideas in a variety of ways (e.g., through a variety of embedded clauses, or by compounding verbs or prepositional phrases, nominalization) to create precise simple, compound, and complex sentences that condense concrete and abstract ideas (e.g., Another issue that people may be concerned with is the amount of money that it will cost to construct the new building). |

## ELD Standards Grades 11-12

### Part I: Interacting in Meaningful Ways

| | | Emerging | Expanding | Bridging |
|---|---|---|---|---|
| Collaborative | *Exchanging information/ideas* | Engage in conversational exchanges and express ideas on familiar current events and academic topics by asking and answering yes-no questions and wh- questions and responding using phrases and short sentences. | Contribute to class, group, and partner discussions, sustaining conversations on a variety of age and grade-appropriate academic topics by following turn-taking rules, asking and answering relevant, on-topic questions, affirming others, providing additional, relevant information, and paraphrasing key ideas. | Contribute to class, group, and partner discussions, sustaining conversations on a variety of age and grade-appropriate academic topics by following turn-taking rules, asking and answering relevant, on-topic questions, affirming others, and providing coherent and well-articulated comments and additional information. |
| Collaborative | *Interacting via written English* | Collaborate with peers to engage in short, grade-appropriate written exchanges and writing projects, using technology as appropriate. | Collaborate with peers to engage in increasingly complex grade-appropriate written exchanges and writing projects, using technology as appropriate. | Collaborate with peers to engage in a variety of extended written exchanges and complex grade-appropriate writing projects, using technology as appropriate. |
| Collaborative | *Supporting opinions and persuading others* | Negotiate with or persuade others in conversations (e.g., to provide counter-arguments) using learned phrases (e.g., Could you repeat that please? I believe . . .) and open responses to express and defend opinions. | Negotiate with and persuade others (e.g., by presenting counter-arguments) in discussions and conversations using learned phrases (e.g., You make a valid point, but my view is . . .) and open responses to express and defend nuanced opinions. | Negotiate with or persuade others in discussions and conversations in appropriate registers (e.g., to acknowledge new information and politely offer a counterpoint) using a variety of learned phrases (e.g., You postulate that X. However, I've reached a different conclusion on this issue) and open responses to express and defend nuanced opinions. |
| Collaborative | *Adapting language choices* | Adjust language choices according to the context (e.g., classroom, community) and audience (e.g., peers, teachers). | Adjust language choices according to the context (e.g., classroom, community), purpose (e.g., to persuade, to provide arguments or counterarguments), task, and audience (e.g., peers, teachers, guest lecturer). | Adjust language choices according to the task (e.g., group presentation of research project), context (e.g., classroom, community), purpose (e.g., to persuade, to provide arguments or counterarguments), and audience (e.g., peers, teachers, college recruiter). |
| Interpretive | *Listening Actively* | Demonstrate comprehension of oral presentations and discussions on familiar social and academic topics by asking and answering questions with prompting and substantial support. | Demonstrate comprehension of oral presentations and discussions on a variety of social and academic topics by asking and answering questions that show thoughtful consideration of the ideas or arguments with moderate support. | Demonstrate comprehension of oral presentations and discussions on a variety of social and academic topics by asking and answering detailed and complex questions that show thoughtful consideration of the ideas or arguments with light support. |
| Interpretive | *Reading/Viewing Closely* | a. Explain ideas, phenomena, processes, and text relationships (e.g., compare/contrast, cause/effect, evidence-based argument) based on close reading of a variety of grade-appropriate texts, presented in various print and multimedia formats, using phrases, short sentences, and a select set of general academic and domain-specific words. b. Explain inferences and conclusions drawn from close reading of grade-appropriate texts and viewing of multimedia, using familiar verbs (e.g., seems that). c. Use knowledge of morphology (e.g., common prefixes and suffixes), context, reference materials, and visual cues to determine the meaning of unknown and multiple-meaning words on familiar topics. | a. Explain ideas, phenomena, processes, and relationships within and across texts (e.g., compare/contrast, cause/effect, themes, evidence-based argument) based on close reading of a variety of grade-appropriate texts, presented in various print and multimedia formats, using increasingly detailed sentences, and a range of general academic and domain-specific words. b. Explain inferences and conclusions drawn from close reading of grade-appropriate texts and viewing of multimedia using a variety of verbs and adverbials (e.g., indicates that, suggests, as a result). c. Use knowledge of morphology (e.g., affixes, Greek and Latin roots), context, reference materials, and visual cues to determine the meaning of unknown and multiple-meaning words on familiar and new topics. | a. Explain ideas, phenomena, processes, and relationships within and across texts (e.g., compare/contrast, cause/effect, themes, evidence-based argument) based on close reading of a variety of grade-level texts, presented in various print and multimedia formats, using a variety of detailed sentences and precise general academic and domain-specific words. b. Explain inferences and conclusions drawn from close reading of grade-level texts and viewing of multimedia using a variety of verbs and adverbials (e.g., creates the impression that, consequently). c. Use knowledge of morphology (e.g., derivational suffixes), context, reference materials, and visual cues to determine the meaning, including figurative and connotative meanings, of unknown and multiple-meaning words on a variety of new topics. |
| Interpretive | *Evaluating Language Choices* | Explain how successfully writers and speakers structure texts and use language (e.g., specific word or phrasing choices) to persuade the reader (e.g., by providing evidence to support claims or connecting points in an argument) or create other specific effects. | Explain how successfully writers and speakers structure texts and use language (e.g., specific word or phrasing choices) to persuade the reader (e.g., by providing well-worded evidence to support claims or connecting points in an argument in specific ways) or create other specific effects, with moderate support. | Explain how successfully writers and speakers structure texts and use language (e.g., specific word or phrasing choices) to persuade the author (e.g., by providing well-worded evidence to support claims or connecting points in an argument in specific ways) or create other specific effects, with light support. |
| Interpretive | *Analyzing Language Choices* | Explain how a writer's or speaker's choice of phrasing or specific words (e.g., describing a character or action as aggressive versus bold) produces nuances or different effects on the audience. | Explain how a writer's or speaker's choice of phrasing or specific words (e.g., using figurative language or words with multiple meanings to describe an event or character) produces nuances and different effects on the audience. | Explain how a writer's or speaker's choice of a variety of different types of phrasing or words (e.g., hyperbole, varying connotations, the cumulative impact of word choices) produces nuances and different effects on the audience. |
| Productive | *Presenting* | Plan and deliver brief oral presentations and reports on grade-appropriate topics that present evidence and facts to support ideas. | Plan and deliver a variety of oral presentations and reports on grade-appropriate topics that present evidence and facts to support ideas by using growing understanding of register. | Plan and deliver a variety of oral presentations and reports on grade-appropriate topics that express complex and abstract ideas well supported by evidence and reasoning, and are delivered by using an appropriate level of formality and understanding of register. |
| Productive | *Writing* | a. Write short literary and informational texts (e.g., an argument about free speech) collaboratively (e.g., with peers) and independently. b. Write brief summaries of texts and experiences by using complete sentences and key words (e.g., from notes or graphic organizers). | a. Write longer literary and informational texts (e.g., an argument about free speech) collaboratively (e.g., with peers) and independently by using appropriate text organization and growing understanding of register. b. Write increasingly concise summaries of texts and experiences by using complete sentences and key words (e.g., from notes or graphic organizers). | a. Write longer and more detailed literary and informational texts (e.g., an argument about free speech) collaboratively (e.g., with peers) and independently by using appropriate text organization and register. b. Write clear and coherent summaries of texts and experiences by using complete and concise sentences and key words (e.g., from notes or graphic organizers). |

| | | Emerging | Expanding | Bridging |
|---|---|---|---|---|
| Productive | *Justifying/Arguing* | a. Justify opinions by articulating some textual evidence or background knowledge with visual support. b. Express attitude and opinions or temper statements with familiar modal expressions (e.g., can, may). | a. Justify opinions and positions or persuade others by making connections between ideas and articulating relevant textual evidence or background knowledge. b. Express attitude and opinions or temper statements with a variety of familiar modal expressions (e.g., possibly/likely, could/would). | a. Justify opinions or persuade others by making connections and distinctions between ideas and texts and articulating sufficient, detailed, and relevant textual evidence or background knowledge by using appropriate register. b. Express attitude and opinions or temper statements with nuanced modal expressions (e.g., possibly/potentially/certainly/ absolutely, should/might). |
| Productive | *Selecting Language Resources* | a. Use familiar general academic (e.g., temperature, document) and domain-specific (e.g., cell, the Depression) words to create clear spoken and written texts. b. Use knowledge of morphology to appropriately select basic affixes (e.g., The news media relies on official sources). | a. Use an increasing variety of grade-appropriate general academic (e.g., fallacy, dissuade) and domain-specific (e.g., chromosome, federalism) academic words accurately and appropriately when producing increasingly complex written and spoken texts. b. Use knowledge of morphology to appropriately select affixes in a growing number of ways to manipulate language (e.g., The cardiac muscle works continuously.). | a. Use a variety of grade-appropriate general (e.g., alleviate, salutary) and domain-specific (e.g., soliloquy, microorganism) academic words and phrases, including persuasive language, accurately and appropriately when producing complex written and spoken texts. b. Use knowledge of morphology to appropriately select affixes in a variety of ways to manipulate language (e.g., changing inaugurate to inauguration). |

### Part II: Learning About How English Works

| | | Emerging | Expanding | Bridging |
|---|---|---|---|---|
| Structuring Cohesive Texts | *Understanding Text Structure* | Apply analysis of the organizational structure of different text types (e.g., how arguments are organized by establishing clear relationships among claims, counterclaims, reasons, and evidence) to comprehending texts and to writing brief arguments, informative/explanatory texts, and narratives. | Apply analysis of the organizational structure of different text types (e.g., how arguments are organized by establishing clear relationships among claims, counterclaims, reasons, and evidence) to comprehending texts and to writing increasingly clear and cohesive arguments, informative/explanatory texts, and narratives. | Apply analysis of the organizational structure of different text types (e.g., how arguments are organized by establishing clear relationships among claims, counterclaims, reasons, and evidence) to comprehending texts and to writing increasingly clear and cohesive arguments, informative/explanatory texts, and narratives. |
| Structuring Cohesive Texts | *Understanding Cohesion* | a. Apply knowledge of familiar language resources for referring to make texts more cohesive (e.g., using pronouns or synonyms to refer back to characters or concepts introduced earlier) to comprehending and writing brief texts. b. Apply knowledge of familiar language resources for linking ideas, events, or reasons throughout a text (e.g., using connecting/transition words and phrases, such as first, second, finally) to comprehending and writing brief texts. | a. Apply knowledge of a growing number of language resources for referring to make texts more cohesive (e.g., using nominalizations to refer back to an action or activity described earlier) to comprehending texts and to writing increasingly cohesive texts for specific purposes and audiences. b. Apply knowledge of familiar language resources for linking ideas, events, or reasons throughout a text (e.g., using connecting/ transition words and phrases, such as meanwhile, however, on the other hand) to comprehending texts and to writing increasingly cohesive texts for specific purposes and audiences. | a. Apply knowledge of a variety of resources for referring to make texts more cohesive (e.g., using nominalization, paraphrases, or summaries to reference or recap an idea or explanation provided earlier) to comprehending grade-level texts and to writing clear and cohesive texts for specific purposes and audiences. b. Apply knowledge of familiar language resources for linking ideas, events or reasons throughout a text (e.g., using connecting/ transition words and phrases, such as on the contrary, in addition, moreover) to comprehending grade-level texts and writing cohesive texts for specific purposes and audiences. |
| Expanding and Enriching Ideas | *Using Verbs and Verb Phrases* | Use a variety of verbs in different tenses (e.g., past, present, future, simple, progressive) appropriate to the text type and discipline to create short texts on familiar academic topics. | Use a variety of verbs in different tenses (e.g., past, present, future, simple, progressive, perfect) appropriate to the text type and discipline to create a variety of texts that explain, describe, and summarize concrete and abstract thoughts and ideas. | Use a variety of verbs in different tenses (e.g., past, present, future, simple, progressive, perfect), and mood (e.g., subjunctive) appropriate to the text type and discipline to create a variety of texts that describe concrete and abstract ideas, explain procedures and sequences, summarize texts and ideas, and present and critique points of view. |
| Expanding and Enriching Ideas | *Using Nouns and Noun Phrases* | Expand noun phrases to create increasingly detailed sentences (e.g., adding adjectives for precision) about personal and familiar academic topics. | Expand noun phrases in a growing number of ways (e.g., adding adjectives to nouns, simple clause embedding) to create detailed sentences that accurately describe, explain, and summarize information and ideas on a variety of personal and academic topics. | Expand noun phrases in a variety of ways (e.g., complex clause embedding) to create detailed sentences that accurately describe concrete and abstract ideas, explain procedures and sequences, summarize texts and ideas, and present and critique points of view on a variety of academic topics. |
| Expanding and Enriching Ideas | *Modifying to Add Details* | Expand sentences with simple adverbials (e.g., adverbs, adverb phrases, prepositional phrases) to provide details (e.g., time, manner, place, cause) about familiar activities or processes. | Expand sentences with a growing variety of adverbials (e.g., adverbs, adverb phrases, prepositional phrases) to provide details (e.g., time, manner, place, cause) about familiar or new activities or processes. | Expand sentences with a variety of adverbials (e.g., adverbs, adverb phrases and clauses, prepositional phrases) to provide details (e.g., time, manner, place, cause) about a variety of familiar and new activities and processes. |
| Connecting and Condensing Ideas | *Connecting Ideas* | Combine clauses in a few basic ways (e.g., creating compound sentences using and, but, so; creating complex sentences using because) to make connections between and join ideas (e.g., I want to read this book because it tells the history of Pi). | Combine clauses in a growing number of ways to create compound and complex sentences that make connections between and link concrete and abstract ideas, for example, to express a reason (e.g., He stayed at home on Sunday in order to study for Monday's exam) or to make a concession (e.g., She studied all night even though she wasn't feeling well). | Combine clauses in a variety of ways to create compound and complex sentences that make connections between and link concrete and abstract ideas, for example, to make a concession (e.g., While both characters strive for success, they each take different approaches to reach their goals), or to establish cause (e.g., Women's lives were changed forever after World War II as a result of joining the workforce). |
| Connecting and Condensing Ideas | *Condensing Ideas* | Condense ideas in a few basic ways (e.g., by compounding verb or prepositional phrases) to create precise and detailed simple, compound, and complex sentences (e.g., The students asked survey questions and recorded the responses). | Condense ideas in a growing number of ways (e.g., through embedded clauses or by compounding verb or prepositional phrases) to create more precise and detailed simple, compound, and complex sentences (e.g., Species that could not adapt to the changing climate eventually disappeared). | Condense ideas in a variety of ways (e.g., through a variety of embedded clauses, or by compounding verb or prepositional phrases, nominalization) to create precise simple, compound, and complex sentences that condense concrete and abstract ideas (e.g., The epidemic, which ultimately affected hundreds of thousands of people, did not subside for another year). |

# HS-PS1 Matter and Its Interactions

**HS-PS1 Matter and Its Interactions**

Students who demonstrate understanding can:

**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.** [Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.] [Assessment Boundary: Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.]

**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.** [Clarification Steatement: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.] [Assessment Boundary: Assessment is limited to chemical reactions involving main group elements and combustion reactions.]

**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.** [Clarification Statement: Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.] [Assessment Boundary: Assessment does not include Raoult's law calculations of vapor pressure.]

**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.** [Clarification Statement: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.] [Assessment Boundary: Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.]

**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.** [Clarification Statement: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.] [Assessment Boundary: Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.]

**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.*** [Clarification Statement: Emphasis is on the application of Le Chatelier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products.] [Assessment Boundary: Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.]

**HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.** [Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.] [Assessment Boundary: Assessment does not include complex chemical reactions.]

**HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.** [Clarification Statement: Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.] [Assessment Boundary: Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Developing and Using Models**

Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

- Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS1-4),(HS-PS1-8)
- Use a model to predict the relationships between systems or between components of a system. (HS-PS1-1)

**Planning and Carrying Out Investigations**

Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS1-3)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on

## Disciplinary Core Ideas

**PS1.A: Structure and Properties of Matter**

- Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (HS-PS1-1)
- The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (HS-PS1-1),(HS-PS1-2)
- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (HS-PS1-3),*(secondary to HS-PS2-6)*
- A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart. (HS-PS1-4)

**PS1.B: Chemical Reactions**

- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (HS-PS1-4),(HS-PS1-5)
- In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. (HS-PS1-6)
- The fact that atoms are conserved, together with knowledge of the chemical properties of the elements

## Crosscutting Concepts

**Patterns**

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-PS1-1),(HS-PS1-2),(HS-PS1-3),(HS-PS1-5)

**Energy and Matter**

- In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. (HS-PS1-8)
- The total amount of energy and matter in closed systems is conserved. (HS-PS1-7)
- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-PS1-4)

**Stability and Change**

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-PS1-6)

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*Connections to Nature of Science*

**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**

- Science assumes the universe is a vast single system in which basic laws are

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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| | | |
|---|---|---|
| mathematical models of basic assumptions.<br>▪ Use mathematical representations of phenomena to support claims. (HS-PS1-7)<br>**Constructing Explanations and Designing Solutions**<br>Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.<br>▪ Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects. (HS-PS1-5)<br>▪ Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-PS1-2)<br>▪ Refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-PS1-6) | involved, can be used to describe and predict chemical reactions. (HS-PS1-2),(HS-PS1-7)<br>**PS1.C: Nuclear Processes**<br>▪ Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process. (HS-PS1-8)<br>**PS1.A: Structure and Properties of Matter**<br>▪ Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. *(secondary to HS-PS1-1),(secondary to HS-PS1-3)*<br>**ETS1.C: Optimizing the Design Solution**<br>▪ Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. *(secondary to HS-PS1-6)* | consistent. (HS-PS1-7) |

*Connections to other DCIs in this grade-band:* **HS.PS3.A** (HS-PS1-4),(HS-PS1-5),(HS-PS1-8); **HS.PS3.B** (HS-PS1-4),(HS-PS1-6),(HS-PS1-7),(HS-PS1-8); **HS.PS3.C** (HS-PS1-8); **HS.PS3.D** (HS-PS1-4),(HS-PS1-8); **HS.LS1.C** (HS-PS1-1),(HS-PS1-2),(HS-PS1-4),(HS-PS1-7); **HS.LS2.B** (HS-PS1-7); **HS.ESS1.A** (HS-PS1-8); **HS.ESS1.C** (HS-PS1-8); **HS.ESS2.C** (HS-PS1-2),(HS-PS1-3)

*Articulation to DCIs across grade-bands:* **MS.PS1.A** (HS-PS1-1),(HS-PS1-2),(HS-PS1-3),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7),(HS-PS1-8); **MS.PS1.B** (HS-PS1-1),(HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-6),(HS-PS1-7),(HS-PS1-8); **MS.PS1.C** (HS-PS1-8); **MS.PS2.B** (HS-PS1-3),(HS-PS1-4),(HS-PS1-5); **MS.PS3.A** (HS-PS1-5); **MS.PS3.B** (HS-PS1-5); **MS.PS3.D** (HS-PS1-4); **MS.LS1.C** (HS-PS1-4),(HS-PS1-7); **MS.LS2.B** (HS-PS1-7); **MS.ESS2.A** (HS-PS1-7),(HS-PS1-8)

*Common Core State Standards Connections:*

*ELA/Literacy –*

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|---|---|
| **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. *(HS-PS1-1)* |
| **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. (HS-PS1-3),(HS-PS1-5) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS1-2),*(HS-PS1-5)* |
| **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. (HS-PS1-2) |
| **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. (HS-PS1-3),*(HS-PS1-6)* |
| **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. (HS-PS1-3) |
| **WHST.9-12.9** | Draw evidence from informational texts to support analysis, reflection, and research. *(HS-PS1-3)* |
| **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. *(HS-PS1-4)* |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-PS1-5),(HS-PS1-7) |
| **MP.4** | Model with mathematics. *(HS-PS1-4),(HS-PS1-8)* |
| **HSN-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. (HS-PS1-2),*(HS-PS1-3),(HS-PS1-4),(HS-PS1-5)*,(HS-PS1-7),(HS-PS1-8) |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. (HS-PS1-4),*(HS-PS1-7)*,(HS-PS1-8) |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. *(HS-PS1-2),(HS-PS1-3),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7),(HS-PS1-8)* |

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
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# HS-PS2 Motion and Stability: Forces and Interactions

**HS-PS2 Motion and Stability: Forces and Interactions**

Students who demonstrate understanding can:

**HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.** [Clarification Statement: Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force.] [Assessment Boundary: Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.]

**HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.** [Clarification Statement: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle.] [Assessment Boundary: Assessment is limited to systems of two macroscopic bodies moving in one dimension.]

**HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*** [Clarification Statement: Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute.] [Assessment Boundary: Assessment is limited to qualitative evaluations and/or algebraic manipulations.]

**HS-PS2-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.** [Clarification Statement: Emphasis is on both quantitative and conceptual descriptions of gravitational and electric fields.] [Assessment Boundary: Assessment is limited to systems with two objects.]

**HS-PS2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.** [Assessment Boundary: Assessment is limited to designing and conducting investigations with provided materials and tools.]

**HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.*** [Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.] [Assessment Boundary: Assessment is limited to provided molecular structures of specific designed materials.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Planning and Carrying Out Investigations**

Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS2-5)

**Analyzing and Interpreting Data**

Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. (HS-PS2-1)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical representations of phenomena to describe explanations. (HS-PS2-2),(HS-PS2-4)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects. (HS-PS2-3)

**Obtaining, Evaluating, and Communicating Information**

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats

## Disciplinary Core Ideas

**PS1.A: Structure and Properties of Matter**

- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (secondary to HS-PS2-6)

**PS2.A: Forces and Motion**

- Newton's second law accurately predicts changes in the motion of macroscopic objects. (HS-PS2-1)
- Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. (HS-PS2-2)
- If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. (HS-PS2-2),(HS-PS2-3)

**PS2.B: Types of Interactions**

- Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. (HS-PS2-4)
- Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (HS-PS2-4),(HS-PS2-5)
- Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (HS-PS2-6),*(secondary to HS-PS1-1)*,*(secondary to HS-PS1-3)*

**PS3.A: Definitions of Energy**

- "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents. *(secondary to HS-PS2-5)*

**ETS1.A: Defining and Delimiting Engineering Problems**

- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. *(secondary to HS-PS2-3)*

**ETS1.C: Optimizing the Design Solution**

- Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. *(secondary to HS-PS2-3)*

## Crosscutting Concepts

**Patterns**

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-PS2-4)

**Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-PS2-1),(HS-PS2-5)
- Systems can be designed to cause a desired effect. (HS-PS2-3)

**Systems and System Models**

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined. (HS-PS2-2)

**Structure and Function**

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-PS2-6)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

| | | |
|---|---|---|
| (including orally, graphically, textually, and mathematically). (HS-PS2-6)<br>------------------------------------------------------<br>*Connections to Nature of Science*<br>**Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**<br>▪ Theories and laws provide explanations in science. (HS-PS2-1),(HS-PS2-4)<br>▪ Laws are statements or descriptions of the relationships among observable phenomena. (HS-PS2-1),(HS-PS2-4) | | |

*Connections to other DCIs in this grade-band:* **HS.PS3.A** (HS-PS2-4),(HS-PS2-5); **HS.PS3.C** (HS-PS2-1); **HS.PS4.B** (HS-PS2-5); **HS.ESS1.A** (HS-PS2-1),(HS-PS2-2),(HS-PS2-4); **HS.ESS1.B** (HS-PS2-4); **HS.ESS1.C** (HS-PS2-1),(HS-PS2-2),(HS-PS2-4); **HS.ESS2.A** (HS-PS2-5); **HS.ESS2.C** (HS-PS2-1),(HS-PS2-4); **HS.ESS3.A** (HS-PS2-4),(HS-PS2-5)

*Articulation to DCIs across grade-bands:* **MS.PS1.A** (HS-PS2-6); **MS.PS2.A** (HS-PS2-1),(HS-PS2-2),(HS-PS2-3); **MS.PS2.B** (HS-PS2-4),(HS-PS2-5),(HS-PS2-6); **MS.PS3.C** (HS-PS2-1),(HS-PS2-2),(HS-PS2-3); **MS.ESS1.B** (HS-PS2-4),(HS-PS2-5)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. *(HS-PS2-1),(HS-PS2-6)* |
| **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. (HS-PS2-1) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-PS2-6)* |
| **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. (HS-PS2-3),(HS-PS2-5) |
| **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. *(HS-PS2-5)* |
| **WHST.9-12.9** | Draw evidence from informational texts to support analysis, reflection, and research. *(HS-PS2-1),(HS-PS2-5)* |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4) |
| **MP.4** | Model with mathematics. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4) |
| **HSN-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. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4),*(HS-PS2-5),(HS-PS2-6)* |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. *(HS-PS2-1),(HS-PS2-2),(HS-PS2-4),(HS-PS2-5),(HS-PS2-6)* |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4),*(HS-PS2-5),(HS-PS2-6)* |
| **HSA-SSE.A.1** | Interpret expressions that represent a quantity in terms of its context. (HS-PS2-1),(HS-PS2-4) |
| **HSA-SSE.B.3** | Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. (HS-PS2-1),(HS-PS2-4) |
| **HSA-CED.A.1** | Create equations and inequalities in one variable and use them to solve problems. (HS-PS2-1),(HS-PS2-2) |
| **HSA-CED.A.2** | Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *(HS-PS2-1),(HS-PS2-2)* |
| **HSA-CED.A.4** | Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *(HS-PS2-1),(HS-PS2-2)* |
| **HSF-IF.C.7** | Graph functions expressed symbolically and show key features of the graph, by in hand in simple cases and using technology for more complicated cases. *(HS-PS2-1)* |
| **HSS-ID.A.1** | Represent data with plots on the real number line (dot plots, histograms, and box plots). *(HS-PS2-1)* |

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
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# HS-PS3 Energy

**HS-PS3 Energy**

Students who demonstrate understanding can:

**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.** [Clarification Statement: Emphasis is on explaining the meaning of mathematical expressions used in the model.] [Assessment Boundary: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.]

**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).** [Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.]

**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.*** [Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.] [Assessment Boundary: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.]

**HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).** [Clarification Statement: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.] [Assessment Boundary: Assessment is limited to investigations based on materials and tools provided to students.]

**HS-PS3-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.** [Clarification Statement: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.] [Assessment Boundary: Assessment is limited to systems containing two objects.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Developing and Using Models**

Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS3-2),(HS-PS3-5)

**Planning and Carrying Out Investigations**

Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS3-4)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Create a computational model or simulation of a phenomenon, designed device, process, or system. (HS-PS3-1)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Design, evaluate, and/or refine a solution to a

## Disciplinary Core Ideas

**PS3.A: Definitions of Energy**

- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (HS-PS3-1),(HS-PS3-2)
- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (HS-PS3-2) (HS-PS3-3)
- These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (HS-PS3-2)

**PS3.B: Conservation of Energy and Energy Transfer**

- Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (HS-PS3-1)
- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (HS-PS3-1),(HS-PS3-4)
- Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (HS-PS3-1)
- The availability of energy limits what can occur in any system. (HS-PS3-1)
- Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (HS-PS3-4)

**PS3.C: Relationship Between Energy and Forces**

- When two objects interacting through a field change relative position, the energy stored in the field is changed. (HS-PS3-5)

**PS3.D: Energy in Chemical Processes**

- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the

## Crosscutting Concepts

**Cause and Effect**

- Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system. (HS-PS3-5)

**Systems and System Models**

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-PS3-4)
- Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models. (HS-PS3-1)

**Energy and Matter**

- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-PS3-3)
- Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems. (HS-PS3-2)

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***Connections to Engineering, Technology, and Applications of Science***

**Influence of Science, Engineering, and Technology on Society and the Natural World**

- Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-PS3-3)

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***Connections to Nature of Science***

**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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| | | |
|---|---|---|
| complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-PS3-3) | surrounding environment. (HS-PS3-3),(HS-PS3-4)<br>**ETS1.A: Defining and Delimiting Engineering Problems**<br>▪ Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. *(secondary to HS-PS3-3)* | ▪ Science assumes the universe is a vast single system in which basic laws are consistent. (HS-PS3-1) |

*Connections to other DCIs in this grade-band:* **HS.PS1.A** (HS-PS3-2); **HS.PS1.B** (HS-PS3-1),(HS-PS3-2); **HS.PS2.B** (HS-PS3-2),(HS-PS3-5); **HS.LS2.B** (HS-PS3-1); **HS.ESS1.A** (HS-PS3-1),(HS-PS3-4); **HS.ESS2.A** (HS-PS3-1),(HS-PS3-2),(HS-PS3-4); **HS.ESS2.D** (HS-PS3-4); **HS.ESS3.A** (HS-PS3-3)

*Articulation to DCIs across grade-bands:* **MS.PS1.A** (HS-PS3-2); **MS.PS2.B** (HS-PS3-2),(HS-PS3-5); **MS.PS3.A** (HS-PS3-1),(HS-PS3-2),(HS-PS3-3); **MS.PS3.B** (HS-PS3-1),(HS-PS3-3),(HS-PS3-4); **MS.PS3.C** (HS-PS3-2),(HS-PS3-5); **MS.ESS2.A** (HS-PS3-1),(HS-PS3-3)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. *(HS-PS3-4)* |
| **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. *(HS-PS3-3),* (HS-PS3-4),*(HS-PS3-5)* |
| **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. (HS-PS3-4),*(HS-PS3-5)* |
| **WHST.9-12.9** | Draw evidence from informational texts to support analysis, reflection, and research. *(HS-PS3-4),(HS-PS3-5)* |
| **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. *(HS-PS3-1),(HS-PS3-2),(HS-PS3-5)* |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-PS3-1),(HS-PS3-2),(HS-PS3-3),(HS-PS3-4),(HS-PS3-5) |
| **MP.4** | Model with mathematics. (HS-PS3-1),(HS-PS3-2),(HS-PS3-3),*(HS-PS3-4),*(HS-PS3-5) |
| **HSN-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. (HS-PS3-1),(HS-PS3-3) |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. (HS-PS3-1),(HS-PS3-3) |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS3-1),(HS-PS3-3) |

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# HS-PS4 Waves and Their Applications in Technologies for Information Transfer

**HS-PS4 Waves and Their Applications in Technologies for Information Transfer**

Students who demonstrate understanding can:

**HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.** [Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.]

**HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information.** [Clarification Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.]

**HS-PS4-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.** [Clarification Statement: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect.] [Assessment Boundary: Assessment does not include using quantum theory.]

**HS-PS4-4. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.** [Clarification Statement: Emphasis is on the idea that photons associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.] [Assessment Boundary: Assessment is limited to qualitative descriptions.]

**HS-PS4-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.*** [Clarification Statement: Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology.] [Assessment Boundary: Assessments are limited to qualitative information. Assessments do not include band theory.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Asking Questions and Defining Problems**

Asking questions and defining problems in grades 9–12 builds from grades K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

- Evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of a design. (HS-PS4-2)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking at the 9-12 level builds on K-8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations. (HS-PS4-1)

**Engaging in Argument from Evidence**

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.

- Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-PS4-3)

**Obtaining, Evaluating, and Communicating Information**

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- Evaluate the validity and reliability of multiple claims that appear in scientific and technical texts or media reports, verifying the data when possible. (HS-PS4-4)
- Communicate technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-PS4-5)

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*Connections to Nature of Science*

**Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**

- A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-PS4-3)

## Disciplinary Core Ideas

**PS3.D: Energy in Chemical Processes**

- Solar cells are human-made devices that likewise capture the sun's energy and produce electrical energy. *(secondary to HS-PS4-5)*

**PS4.A: Wave Properties**

- The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. (HS-PS4-1)
- Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. (HS-PS4-2),(HS-PS4-5)
- [From the 3–5 grade band endpoints] Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. (Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up.) (HS-PS4-3)

**PS4.B: Electromagnetic Radiation**

- Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. (HS-PS4-3)
- When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells. (HS-PS4-4)
- Photoelectric materials emit electrons when they absorb light of a high-enough frequency. (HS-PS4-5)

**PS4.C: Information Technologies and Instrumentation**

- Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them. (HS-PS4-5)

## Crosscutting Concepts

**Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-PS4-1)
- Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system. (HS-PS4-4)
- Systems can be designed to cause a desired effect. (HS-PS4-5)

**Systems and System Models**

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-PS4-3)

**Stability and Change**

- Systems can be designed for greater or lesser stability. (HS-PS4-2)

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*Connections to Engineering, Technology, and Applications of Science*

**Interdependence of Science, Engineering, and Technology**

- Science and engineering complement each other in the cycle known as research and development (R&D). (HS-PS4-5)

**Influence of Engineering, Technology, and Science on Society and the Natural World**

- Modern civilization depends on major technological systems. (HS-PS4-2),(HS-PS4-5)
- Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-PS4-2)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas. Integrated and reprinted with permission from the National Academy of Sciences.

# HS-PS4 Waves and Their Applications in Technologies for Information Transfer

*Connections to other DCIs in this grade-band:* **HS.PS1.C** (HS-PS4-4); **HS.LS1.C** (HS-PS4-4); **HS.PS3.A** (HS-PS4-4),(HS-PS4-5); **HS.PS3.D** (HS-PS4-3),(HS-PS4-4); **HS.ESS1.A** (HS-PS4-3); **HS.ESS2.A** (HS-PS4-1); **HS.ESS2.D** (HS-PS4-3)

*Articulation to DCIs across grade-bands:* **MS.PS3.D** (HS-PS4-4); **MS.PS4.A** (HS-PS4-1),(HS-PS4-2),(HS-PS4-5); **MS.PS4.B** (HS-PS4-1),(HS-PS4-2),(HS-PS4-3),(HS-PS4-4),(HS-PS4-5); **MS.PS4.C** (HS-PS4-2),(HS-PS4-5); **MS.LS1.C** (HS-PS4-4); **MS.ESS2.D** (HS-PS4-4)

*Common Core State Standards Connections:*

*ELA/Literacy –*

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| **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. (HS-PS4-2),(HS-PS4-3),(HS-PS4-4) |
| **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. *(HS-PS4-2),(HS-PS4-3),(HS-PS4-4)* |
| **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. *(HS-PS4-1)*,(HS-PS4-4) |
| **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. (HS-PS4-2),(HS-PS4-3),(HS-PS4-4) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-PS4-5)* |
| **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. (HS-PS4-4) |

*Mathematics –*

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| **MP.2** | Reason abstractly and quantitatively. (HS-PS4-1),(HS-PS4-3) |
| **MP.4** | Model with mathematics. (HS-PS4-1) |
| **HSA-SSE.A.1** | Interpret expressions that represent a quantity in terms of its context. (HS-PS4-1),*(HS-PS4-3)* |
| **HSA-SSE.B.3** | Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. *(HS-PS4-1),(HS-PS4-3)* |
| **HSA.CED.A.4** | Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *(HS-PS4-1),(HS-PS4-3)* |

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
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# HS-LS1 From Molecules to Organisms: Structures and Processes

**HS-LS1 From Molecules to Organisms: Structures and Processes**

Students who demonstrate understanding can:

**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.** [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]

**HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.** [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

**HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.** [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

**HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.** [Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.]

**HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.** [Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.] [Assessment Boundary: Assessment does not include specific biochemical steps.]

**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.** [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.] [Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.]

**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.** [Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.] [Assessment Boundary: Assessment should not include identification of the steps or specific processes involved in cellular respiration.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Developing and Using Models**

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)
- Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7)

**Planning and Carrying Out Investigations**

Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)
- Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)

## Disciplinary Core Ideas

**LS1.A: Structure and Function**

- Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) *(Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.)*
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

**LS1.B: Growth and Development of Organisms**

- In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)

**LS1.C: Organization for Matter and Energy Flow in Organisms**

- The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)
- The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6)
- As matter and energy flow through different

## Crosscutting Concepts

**Systems and System Models**

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2), (HS-LS1-4)

**Energy and Matter**

- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6)
- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS1-7)

**Structure and Function**

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

**Stability and Change**

- Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

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The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas. Integrated and reprinted with permission from the National Academy of Sciences.

| | | |
|---|---|---|
| ------------------------------------------------------- *Connections to Nature of Science* <br><br> **Scientific Investigations Use a Variety of Methods** <br> ▪ Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3) | organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS1-6),(HS-LS1-7) <br> ▪ As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment. (HS-LS1-7) | |

*Connections to other DCIs in this grade-band:* **HS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **HS.PS2.B** (HS-LS1-7); **HS.LS3.A** (HS-LS1-1); **HS.PS3.B** (HS-LS1-5),(HS-LS1-7)

*Articulation to DCIs across grade-bands:* **MS.PS1.A** (HS-LS1-6); **MS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.PS3.D** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS1.A** (HS-LS1-1),(HS-LS1-2),(HS-LS1-3),(HS-LS1-4); **MS.LS1.B** (HS-LS1-4); **MS.LS1.C** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS2.B** (HS-LS1-5),(HS-LS1-7); **MS.ESS2.E** (HS-LS1-6); **MS.LS3.A** (HS-LS1-1),(HS-LS1-4); **MS.LS3.B** (HS-LS1-1)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. (HS-LS1-1),(HS-LS1-6) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1-1),(HS-LS1-6) |
| **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. (HS-LS1-6) |
| **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. (HS-LS1-3) |
| **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. *(HS-LS1-3)* |
| **WHST.9-12.9** | Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS-1-1),(HS-LS1-6) |
| **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. *(HS-LS1-2),(HS-LS1-4),(HS-LS1-5),(HS-LS1-7)* |

*Mathematics –*

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| **MP.4** | Model with mathematics. *(HS-LS1-4)* |
| **HSF-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. *(HS-LS1-4)* |
| **HSF-BF.A.1** | Write a function that describes a relationship between two quantities. *(HS-LS1-4)* |

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# HS-LS2 Ecosystems: Interactions, Energy, and Dynamics

**HS-LS2 Ecosystems: Interactions, Energy, and Dynamics**

Students who demonstrate understanding can:

**HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.** [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.] [Assessment Boundary: Assessment does not include deriving mathematical equations to make comparisons.]

**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.** [Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.] [Assessment Boundary: Assessment is limited to provided data.]

**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.** [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.]

**HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.** [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.] [Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow 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.** [Clarification Statement: Examples of models could include simulations and mathematical models.] [Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.]

**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.** [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.]

**HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*** [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]

**HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.** [Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Developing and Using Models**

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show how relationships among variables between systems and their components in the natural and designed worlds.

- Develop a model based on evidence to illustrate the relationships between systems or components of a system. (HS-LS2-5)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical and/or computational representations of phenomena or design solutions to support explanations. (HS-LS2-1)
- Use mathematical representations of phenomena or design solutions to support and revise explanations. (HS-LS2-2)
- Use mathematical representations of phenomena or design solutions to support claims. (HS-LS2-4)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past

## Disciplinary Core Ideas

**LS2.A: Interdependent Relationships in Ecosystems**

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1),(HS-LS2-2)

**LS2.B: Cycles of Matter and Energy Transfer in Ecosystems**

- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)
- Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS2-4)
- Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (HS-LS2-5)

**LS2.C: Ecosystem Dynamics, Functioning, and Resilience**

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6)

## Crosscutting Concepts

**Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS2-8)

**Scale, Proportion, and Quantity**

- The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-LS2-1)
- Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale. (HS-LS2-2)

**Systems and System Models**

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS2-5)

**Energy and Matter**

- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS2-4)
- Energy drives the cycling of matter within and between systems. (HS-LS2-3)

**Stability and Change**

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-LS2-6),(HS-LS2-7)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.



  

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| and will continue to do so in the future. (HS-LS2-3)<br>▪ Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-LS2-7)<br>**Engaging in Argument from Evidence**<br>Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.<br>▪ Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6)<br>▪ Evaluate the evidence behind currently accepted explanations to determine the merits of arguments. (HS-LS2-8)<br>------------------------------------------------------<br>***Connections to Nature of Science***<br>**Scientific Knowledge is Open to Revision in Light of New Evidence**<br>▪ Most scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence. (HS-LS2-2),(HS-LS2-3)<br>▪ Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation. (HS-LS2-6),(HS-LS2-8) | ▪ Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7)<br>**LS2.D: Social Interactions and Group Behavior**<br>▪ Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-LS2-8)<br>**LS4.D: Biodiversity and Humans**<br>▪ Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). *(secondary to HS-LS2-7)*<br>▪ Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. *(secondary to HS-LS2-7) (Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.)*<br>**PS3.D: Energy in Chemical Processes**<br>▪ The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis. *(secondary to HS-LS2-5)*<br>**ETS1.B: Developing Possible Solutions**<br>▪ When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. *(secondary to HS-LS2-7)* | |

*Connections to other DCIs in this grade-band:* **HS.PS1.B** (HS-LS2-3),(HS-LS2-5); **HS.PS3.B** (HS-LS2-3),(HS-LS2-4); **HS.PS3.D** (HS-LS2-3),(HS-LS2-4); **HS.ESS2.A** (HS-LS2-3); **HS.ESS2.D** (HS-LS2-5),(HS-LS2-7); **HS.ESS2.E** (HS-LS2-2),(HS-LS2-6),(HS-LS2-7); **HS.ESS3.A** (HS-LS2-2),(HS-LS2-7); **HS.ESS3.C** (HS-LS2-2),(HS-LS2-7); **HS.ESS3.D** (HS-LS2-2)

*Articulation across grade-bands:* **MS.PS1.B** (HS-LS2-3); **MS.PS3.D** (HS-LS2-3),(HS-LS2-4),(HS-LS2-5); **MS.LS1.B** (HS-LS2-8); **MS.LS1.C** (HS-LS2-3),(HS-LS2-4),(HS-LS2-5); **MS.LS2.A** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6); **MS.LS2.B** (HS-LS2-3),(HS-LS2-4),(HS-LS2-5); **MS.LS2.C** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6),(HS-LS2-7); **MS.ESS2.A** (HS-LS2-5); **MS.ESS2.E** (HS-LS2-6); **MS.ESS3.A** (HS-LS2-1); **MS.ESS3.C** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6),(HS-LS2-7); **MS.ESS3.D** (HS-LS2-7)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. (HS-LS2-6),*(HS-LS2-7)*,*(HS-LS2-8)* |
| **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. *(HS-LS2-1)*,*(HS-LS2-2)*,(HS-LS2-3),(HS-LS2-6),(HS-LS2-8) |
| **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. *(HS-LS2-6)*,*(HS-LS2-7)*,*(HS-LS2-8)* |
| **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. (HS-LS2-6),(HS-LS2-7),(HS-LS2-8) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-LS2-1)*,*(HS-LS2-2)*,(HS-LS2-3) |
| **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. (HS-LS2-3) |
| **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. (HS-LS2-7) |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-6),*(HS-LS2-7)* |
| **MP.4** | Model with mathematics. *(HS-LS2-1)*,*(HS-LS2-2)*,*(HS-LS2-4)* |
| **HSN-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. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),*(HS-LS2-7)* |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. *(HS-LS2-1)*,*(HS-LS2-2)*,*(HS-LS2-4)*,*(HS-LS2-7)* |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),*(HS-LS2-7)* |
| **HSS-ID.A.1** | Represent data with plots on the real number line. *(HS-LS2-6)* |
| **HSS-IC.A.1** | Understand statistics as a process for making inferences about population parameters based on a random sample from that population. *(HS-LS2-6)* |
| **HSS-IC.B.6** | Evaluate reports based on data. (HS-LS2-6) |

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
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# HS-LS3 Heredity: Inheritance and Variation of Traits

**HS-LS3 Heredity: Inheritance and Variation of Traits**

Students who demonstrate understanding can:

**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.** [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]

**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.** [Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.] [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]

**HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.** [Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.] [Assessment Boundary: Assessment does not include Hardy-Weinberg calculations.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Asking Questions and Defining Problems**

Asking questions and defining problems in 9-12 builds on K-8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

- Ask questions that arise from examining models or a theory to clarify relationships. (HS-LS3-1)

**Analyzing and Interpreting Data**

Analyzing data in 9-12 builds on K-8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS3-3)

**Engaging in Argument from Evidence**

Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence. (HS-LS3-2)

## Disciplinary Core Ideas

**LS1.A: Structure and Function**

- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. *(secondary to HS-LS3-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS1-1.)*

**LS3.A: Inheritance of Traits**

- Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. (HS-LS3-1)

**LS3.B: Variation of Traits**

- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (HS-LS3-2)
- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS3-2),(HS-LS3-3)

## Crosscutting Concepts

**Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS3-1),(HS-LS3-2)

**Scale, Proportion, and Quantity**

- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-LS3-3)

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***Connections to Nature of Science***

**Science is a Human Endeavor**

- Technological advances have influenced the progress of science and science has influenced advances in technology. (HS-LS3-3)
- Science and engineering are influenced by society and society is influenced by science and engineering. (HS-LS3-3)

*Connections to other DCIs in this grade-band:* **HS.LS2.A** (HS-LS3-3); **HS.LS2.C** (HS-LS3-3); **HS.LS4.B** (HS-LS3-3); **HS.LS4.C** (HS-LS3-3)

*Articulation across grade-bands:* **MS.LS2.A** (HS-LS3-3); **MS.LS3.A** (HS-LS3-1),(HS-LS3-2); **MS.LS3.B** (HS-LS3-1),(HS-LS3-2),(HS-LS3-3); **MS.LS4.C** (HS-LS3-3)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. *(HS-LS3-1),(HS-LS3-2)* |
| **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. *(HS-LS3-1)* |
| **WHST.9-12.1** | Write arguments focused on *discipline-specific content.* (HS-LS3-2) |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-LS3-2),(HS-LS3-3) |

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

# HS-LS4 Biological Evolution: Unity and Diversity

**HS-LS4 Biological Evolution: Unity and Diversity**

Students who demonstrate understanding can:

**HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.** [Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]

**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.** [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.] [Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.]

**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.** [Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.] [Assessment Boundary: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.]

**HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.** [Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading 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.** [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]

**HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.*** [Clarification Statement: Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Analyzing and Interpreting Data**

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS4-3)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Create or revise a simulation of a phenomenon, designed device, process, or system. (HS-LS4-6)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS4-2),(HS-LS4-4)

**Engaging in Argument from Evidence**

Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current or historical episodes in science.

- Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS4-5)

**Obtaining, Evaluating, and Communicating Information**

Obtaining, evaluating, and communicating information in 9–12

## Disciplinary Core Ideas

**LS4.A: Evidence of Common Ancestry and Diversity**

- Genetic information provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (HS-LS4-1)

**LS4.B: Natural Selection**

- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2),(HS-LS4-3)
- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (HS-LS4-3)

**LS4.C: Adaptation**

- Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (HS-LS4-2)
- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3),(HS-LS4-4)
- Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3)
- Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (HS-LS4-5),(HS-LS4-6)

## Crosscutting Concepts

**Patterns**

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-LS4-1),(HS-LS4-3)

**Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS4-2),(HS-LS4-4),(HS-LS4-5),(HS-LS4-6)

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*Connections to Nature of Science*

**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**

- Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-LS4-1),(HS-LS4-4)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- Communicate scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-LS4-1)

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*Connections to Nature of Science*

**Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**

- A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-LS4-1)

- Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (HS-LS4-5)

**LS4.D: Biodiversity and Humans**

- Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (HS-LS4-6) *(Note: This Disciplinary Core Idea is also addressed by HS-LS2-7.)*

**ETS1.B: Developing Possible Solutions**

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. *(secondary to HS-LS4-6)*
- Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. *(secondary to HS-LS4-6)*

*Connections to other DCIs in this grade-band:* **HS.LS2.A** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); **HS.LS2.D** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); **HS.LS3.A** (HS-LS4-1); **HS.LS3.B** (HS-LS4-1),(HS-LS4-2) (HS-LS4-3),(HS-LS4-5); **HS.ESS1.C** (HS-LS4-1); **HS.ESS2.D** (HS-LS4-6); **HS.ESS2.E** (HS-LS4-2),(HS-LS4-5),(HS-LS4-6); **HS.ESS3.A** (HS-LS4-2),(HS-LS4-5),(HS-LS4-6); **HS.ESS3.C** (HS-LS4-6); **HS.ESS3.D** (HS-LS4-6)

*Articulation across grade-bands:* **MS.LS2.A** (HS-LS4-2),(HS-LS4-3),(HS-LS4-5); **MS.LS2.C** (HS-LS4-5),(HS-LS4-6); **MS.LS3.A** (HS-LS4-1); **MS.LS3.B** (HS-LS4-1),(HS-LS4-2),(HS-LS4-3); **MS.LS4.A** (HS-LS4-1); **MS.LS4.B** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4); **MS.LS4.C** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); **MS.ESS1.C** (HS-LS4-1); **MS.ESS3.C** (HS-LS4-5),(HS-LS4-6)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. *(HS-LS4-1)*,(HS-LS4-2),*(HS-LS4-3)*,(HS-LS4-4) |
| **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. (HS-LS4-5) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-LS4-1)*,(HS-LS4-2),*(HS-LS4-3)*,(HS-LS4-4) |
| **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. *(HS-LS4-6)* |
| **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. (HS-LS4-6) |
| **WHST.9-12.9** | Draw evidence from informational texts to support analysis, reflection, and research. *(HS-LS4-1)*,(HS-LS4-2),*(HS-LS4-3)*,(HS-LS4-4),(HS-LS4-5) |
| **SL.11-12.4** | Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. *(HS-LS4-1)*,*(HS-LS4-2)* |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. *(HS-LS4-1)*,(HS-LS4-2),(HS-LS4-3),*(HS-LS4-4)*,*(HS-LS4-5)* |
| **MP.4** | Model with mathematics. *(HS-LS4-2)* |

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# HS-ESS1 Earth's Place in the Universe

**HS-ESS1 Earth's Place in the Universe**

Students who demonstrate understanding can:

**HS-ESS1-1. Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.** [Clarification Statement: Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11-year sunspot cycle, and non-cyclic variations over centuries.] [Assessment Boundary: Assessment does not include details of the atomic and sub-atomic processes involved with the sun's nuclear fusion.]

**HS-ESS1-2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.** [Clarification Statement: Emphasis is on the astronomical evidence of the red shift of light from galaxies as an indication that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the Big Bang, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the Big Bang theory (3/4 hydrogen and 1/4 helium).]

**HS-ESS1-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements.** [Clarification Statement: Emphasis is on the way nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.] [Assessment Boundary: Details of the many different nucleosynthesis pathways for stars of differing masses are not assessed.]

**HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.** [Clarification Statement: Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons.] [Assessment Boundary: Mathematical representations for the gravitational attraction of bodies and Kepler's Laws of orbital motions should not deal with more than two bodies, nor involve calculus.]

**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.** [Clarification Statement: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust increasing with distance away from a central ancient core (a result of past plate interactions).]

**HS-ESS1-6. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.** [Clarification Statement: Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system 4.6 billion years ago. Examples of evidence include the absolute ages of ancient materials (obtained by radiometric dating of meteorites, moon rocks, and Earth's oldest minerals), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Developing and Using Models**

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).

- Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS1-1)

**Using Mathematical and Computational Thinking**

Mathematical and computational thinking in 9–12 builds on K–8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical or computational representations of phenomena to describe explanations. (HS-ESS1-4)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-ESS1-2)
- Apply scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. (HS-ESS1-6)

**Engaging in Argument from Evidence**

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- Evaluate evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-ESS1-5)

**Obtaining, Evaluating, and Communicating Information**

Obtaining, evaluating, and communicating information in 9–12

## Disciplinary Core Ideas

**ESS1.A: The Universe and Its Stars**

- The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (HS-ESS1-1)
- The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (HS-ESS1-2),(HS-ESS1-3)
- The Big Bang theory is supported by observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe. (HS-ESS1-2)
- Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (HS-ESS1-2),(HS-ESS1-3)

**ESS1.B: Earth and the Solar System**

- Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. (HS-ESS1-4)

**ESS1.C: The History of Planet Earth**

- Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old. (HS-ESS1-5)
- Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. (HS-ESS1-6)

**ESS2.B: Plate Tectonics and Large-Scale System Interactions**

- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. *(ESS2.B Grade 8 GBE) (secondary to*

## Crosscutting Concepts

**Patterns**

- Empirical evidence is needed to identify patterns. (HS-ESS1-5)

**Scale, Proportion, and Quantity**

- The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-ESS1-1)
- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-ESS1-4)

**Energy and Matter**

- Energy cannot be created or destroyed–only moved between one place and another place, between objects and/or fields, or between systems. (HS-ESS1-2)
- In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. (HS-ESS1-3)

**Stability and Change**

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-ESS1-6)

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***Connections to Engineering, Technology, and Applications of Science***

**Interdependence of Science, Engineering, and Technology**

- Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. (HS-ESS1-2),(HS-ESS1-4)

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***Connections to Nature of Science***

**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**

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| builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.<br>▪ Communicate scientific ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-ESS1-3)<br>------------------------------------------------<br>*Connections to Nature of Science*<br>**Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**<br>▪ A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-ESS1-2),(HS-ESS1-6)<br>▪ Models, mechanisms, and explanations collectively serve as tools in the development of a scientific theory. (HS-ESS1-6) | *HS-ESS1-5)*<br>**PS1.C: Nuclear Processes**<br>▪ Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. *(secondary to HS-ESS1-5),(secondary to HS-ESS1-6)*<br>**PS3.D: Energy in Chemical Processes and Everyday Life**<br>▪ Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. *(secondary to HS-ESS1-1)*<br>**PS4.B Electromagnetic Radiation**<br>▪ Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities. *(secondary to HS-ESS1-2)* | ▪ Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-ESS1-2)<br>▪ Science assumes the universe is a vast single system in which basic laws are consistent. (HS-ESS1-2) |

*Connections to other DCIs in this grade-band:* **HS.PS1.A** (HS-ESS1-2),(HS-ESS1-3); **HS.PS1.C** (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3); **HS.PS2.A** (HS-ESS1-6); **HS.PS2.B** (HS-ESS1-4),(HS-ESS1-6); **HS.PS3.A** (HS-ESS1-1),(HS-ESS1-2); **HS.PS3.B** (HS-ESS1-2),(HS-ESS1-5); **HS.PS4.A** (HS-ESS1-2); **HS.ESS2.A** (HS-ESS1-5)

*Articulation of DCIs across grade-bands:* **MS.PS1.A** (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3); **MS.PS2.A** (HS-ESS1-4); **MS.PS2.B** (HS-ESS1-4),(HS-ESS1-6); **MS.PS4.B** (HS-ESS1-1),(HS-ESS1-2); **MS.ESS1.A** (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3),(HS-ESS1-4); **MS.ESS1.B** (HS-ESS1-4),(HS-ESS1-6); **MS.ESS1.C** (HS-ESS1-5),(HS-ESS1-6); **MS.ESS2.A** (HS-ESS1-1),(HS-ESS1-5),(HS-ESS1-6); **MS.ESS2.B** (HS-ESS1-5),(HS-ESS1-6); **MS.ESS2.D** (HS-ESS1-1)

*Common Core State Standards Connections:*

*ELA/Literacy –*

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| **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. *(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-5),(HS-ESS1-6)* |
| **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. (HS-ESS1-5),(HS-ESS1-6) |
| **WHST.9-12.1** | Write arguments focused on *discipline-specific content.* (HS-ESS1-6) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-ESS1-2),*(HS-ESS1-3),(HS-ESS1-5)* |
| **SL.11-12.4** | Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. *(HS-ESS1-3)* |

*Mathematics –*

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| **MP.2** | Reason abstractly and quantitatively. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6) |
| **MP.4** | Model with mathematics. (HS-ESS1-1),(HS-ESS1-4) |
| **HSN-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. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6) |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS1-1),*(HS-ESS1-2)*,(HS-ESS1-4),*(HS-ESS1-5),(HS-ESS1-6)* |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6) |
| **HSA-SSE.A.1** | Interpret expressions that represent a quantity in terms of its context. *(HS-ESS1-1),(HS-ESS1-2)*,(HS-ESS1-4) |
| **HSA-CED.A.2** | Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)* |
| **HSA-CED.A.4** | Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)* |
| **HSF-IF.B.5** | Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *(HS-ESS1-6)* |
| **HSS-ID.B.6** | Represent data on two quantitative variables on a scatter plot, and describe how those variables are related. *(HS-ESS1-6)* |

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas. Integrated and reprinted with permission from the National Academy of Sciences.

# HS-ESS2 Earth's Systems

**HS-ESS2 Earth's Systems**

Students who demonstrate understanding can:

**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.** [Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).] [Assessment Boundary: Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.]

**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.** [Clarification Statement: Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth's surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.]

**HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.** [Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.]

**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.** [Clarification Statement: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.] [Assessment Boundary: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.]

**HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.** [Clarification Statement: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids).]

**HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.** [Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.]

**HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.** [Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples of include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.] [Assessment Boundary: Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Developing and Using Models**
Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).

- Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-6)
- Use a model to provide mechanistic accounts of phenomena. (HS-ESS2-4)

**Planning and Carrying Out Investigations**
Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-ESS2-5)

**Analyzing and Interpreting Data**
Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. (HS-ESS2-2)

## Disciplinary Core Ideas

**ESS1.B: Earth and the Solar System**

- Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes. *(secondary to HS-ESS2-4)*

**ESS2.A: Earth Materials and Systems**

- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (HS-ESS2-1),(HS-ESS2-2)
- Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. (HS-ESS2-3)
- The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (HS-ESS2-4)

**ESS2.B: Plate Tectonics and Large-Scale System Interactions**

- The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (HS-ESS2-3)

## Crosscutting Concepts

**Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-ESS2-4)

**Energy and Matter**

- The total amount of energy and matter in closed systems is conserved. (HS-ESS2-6)
- Energy drives the cycling of matter within and between systems. (HS-ESS2-3)

**Structure and Function**

- The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials. (HS-ESS2-5)

**Stability and Change**

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-ESS2-7)
- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS2-1)
- Feedback (negative or positive) can stabilize or destabilize a system. (HS-ESS2-2)

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***Connections to Engineering, Technology, and Applications of Science***

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# HS-ESS2 Earth's Systems

**Engaging in Argument from Evidence**
Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- Construct an oral and written argument or counter-arguments based on data and evidence. (HS-ESS2-7)

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*Connections to Nature of Science*

**Scientific Knowledge is Based on Empirical Evidence**

- Science knowledge is based on empirical evidence. (HS-ESS2-3)
- Science disciplines share common rules of evidence used to evaluate explanations about natural systems. (HS-ESS2-3)
- Science includes the process of coordinating patterns of evidence with current theory. (HS-ESS2-3)
- Science arguments are strengthened by multiple lines of evidence supporting a single explanation. (HS-ESS2-4)

- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. *(ESS2.B Grade 8 GBE)* (HS-ESS2-1)

**ESS2.C: The Roles of Water in Earth's Surface Processes**

- The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (HS-ESS2-5)

**ESS2.D: Weather and Climate**

- The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (HS-ESS2-2),(HS-ESS2-4)
- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS2-6),(HS-ESS2-7)
- Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2-6),(HS-ESS2-4)

**ESS2.E: Biogeology**

- The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it. (HS-ESS2-7)

**PS4.A: Wave Properties**

- Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. *(secondary to HS-ESS2-3)*

**Interdependence of Science, Engineering, and Technology**

- Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. (HS-ESS2-3)

**Influence of Engineering, Technology, and Science on Society and the Natural World**

- New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ESS2-2)

*Connections to other DCIs in this grade-band:* **HS.PS1.A** (HS-ESS2-5),(HS-ESS2-6); **HS.PS1.B** (HS-ESS2-5),(HS-ESS2-6); **HS.PS2.B** (HS-ESS2-1),(HS-ESS2-3); **HS.PS3.A** (HS-ESS2-4); **HS.PS3.B** (HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-5); **HS.PS3.D** (HS-ESS2-3),(HS-ESS2-6); **HS.PS4.B** (HS-ESS2-2); **HS.LS1.C** (HS-ESS2-6); **HS.LS2.A** (HS-ESS2-7); **HS.LS2.B** (HS-ESS2-2),(HS-ESS2-6); **HS.LS2.C** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-7); **HS.LS4.A** (HS-ESS2-7); **HS.LS4.B** (HS-ESS2-7); **HS.LS4.C** (HS-ESS2-7); **HS.LS4.D** (HS-ESS2-2),(HS-ESS2-7); **HS.ESS1.C** (HS-ESS2-4); **HS.ESS3.C** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6); **HS.ESS3.D** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6)

*Articulation of DCIs across grade-bands:* **MS.PS1.A** (HS-ESS2-3),(HS-ESS2-5),(HS-ESS2-6); **MS.PS1.B** (HS-ESS2-3); **MS.PS2.B** (HS-ESS2-1),(HS-ESS2-3); **MS.PS3.A** (HS-ESS2-3),(HS-ESS2-4); **MS.PS3.B** (HS-ESS2-3),(HS-ESS2-4); **MS.PS3.D** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6); **MS.PS4.B** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6); **MS.LS1.C** (HS-ESS2-4); **MS.LS2.A** (HS-ESS2-7); **MS.LS2.B** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6); **MS.LS2.C** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-7); **MS.LS4.A** (HS-ESS2-7); **MS.LS4.B** (HS-ESS2-7); **MS.LS4.C** (HS-ESS2-2),(HS-ESS2-7); **MS.ESS1.C** (HS-ESS2-1),(HS-ESS2-7); **MS.ESS2.A** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6),(HS-ESS2-7); **MS.ESS2.B** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6); **MS.ESS2.C** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6),(HS-ESS2-7); **MS.ESS2.D** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-5); **MS.ESS3.C** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6),(HS-ESS2-7); **MS.ESS3.D** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. *(HS-ESS2-2),(HS-ESS2-3)* |
| **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. *(HS-ESS2-2)* |
| **WHST.9-12.1** | Write arguments focused on *discipline-specific content.* (HS-ESS2-7) |
| **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. (HS-ESS2-5) |
| **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. *(HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-4)* |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6) |
| **MP.4** | Model with mathematics. (HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6) |
| **HSN-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. (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6) |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6) |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6) |

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# HS-ESS3 Earth and Human Activity

**HS-ESS3 Earth and Human Activity**

Students who demonstrate understanding can:

**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.** [Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.]

**HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.*** [Clarification Statement: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen.]

**HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.** [Clarification Statement: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.] [Assessment Boundary: Assessment for computational simulations is limited to using provided multi-parameter programs or constructing simplified spreadsheet calculations.]

**HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*** [Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).]

**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.** [Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.]

**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.** [Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.] [Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Analyzing and Interpreting Data**

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Analyze data using computational models in order to make valid and reliable scientific claims. (HS-ESS3-5)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Create a computational model or simulation of a phenomenon, designed device, process, or system. (HS-ESS3-3)
- Use a computational representation of phenomena or design solutions to describe and/or support claims and/or explanations. (HS-ESS3-6)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific knowledge, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-ESS3-1)
- Design or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ESS3-4)

**Engaging in Argument from Evidence**

Engaging in argument from evidence in 9–12 builds on K–8

## Disciplinary Core Ideas

**ESS2.D: Weather and Climate**

- Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. *(secondary to HS-ESS3-6)*

**ESS3.A: Natural Resources**

- Resource availability has guided the development of human society. (HS-ESS3-1)
- All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2)

**ESS3.B: Natural Hazards**

- Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1)

**ESS3.C: Human Impacts on Earth Systems**

- The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3)
- Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS3-4)

**ESS3.D: Global Climate Change**

- Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (HS-ESS3-5)
- Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (HS-ESS3-6)

**ETS1.B: Developing Possible Solutions**

- When evaluating solutions, it is important to take into

## Crosscutting Concepts

**Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-ESS3-1)

**Systems and System Models**

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-ESS3-6)

**Stability and Change**

- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS3-3),(HS-ESS3-5)
- Feedback (negative or positive) can stabilize or destabilize a system. (HS-ESS3-4)

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***Connections to Engineering, Technology, and Applications of Science***

**Influence of Engineering, Technology, and Science on Society and the Natural World**

- Modern civilization depends on major technological systems. (HS-ESS3-1),(HS-ESS3-3)
- Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-ESS3-2),(HS-ESS3-4)
- New technologies can have deep impacts

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

| | | |
|---|---|---|
| experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.<br>▪ Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations). (HS-ESS3-2)<br>------------------------------<br>*Connections to Nature of Science*<br>**Scientific Investigations Use a Variety of Methods**<br>▪ Science investigations use diverse methods and do not always use the same set of procedures to obtain data. (HS-ESS3-5)<br>▪ New technologies advance scientific knowledge. (HS-ESS3-5)<br>**Scientific Knowledge is Based on Empirical Evidence**<br>▪ Science knowledge is based on empirical evidence. (HS-ESS3-5)<br>▪ Science arguments are strengthened by multiple lines of evidence supporting a single explanation. (HS-ESS3-5) | account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. *(secondary to HS-ESS3-2),(secondary HS-ESS3-4)* | on society and the environment, including some that were not anticipated. (HS-ESS3-3)<br>▪ Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ESS3-2)<br>------------------------------<br>*Connections to Nature of Science*<br>**Science is a Human Endeavor**<br>▪ Science is a result of human endeavors, imagination, and creativity. (HS-ESS3-3)<br>**Science Addresses Questions About the Natural and Material World**<br>▪ Science and technology may raise ethical issues for which science, by itself, does not provide answers and solutions. (HS-ESS3-2)<br>▪ Science knowledge indicates what can happen in natural systems—not what should happen. The latter involves ethics, values, and human decisions about the use of knowledge. (HS-ESS3-2)<br>▪ Many decisions are not made using science alone, but rely on social and cultural contexts to resolve issues. (HS-ESS3-2) |

*Connections to other DCIs in this grade-band:* **HS.PS1.B** (HS-ESS3-3); **HS.PS3.B** (HS-ESS3-2),(HS-ESS3-5); **HS.PS3.D** (HS-ESS3-2),(HS-ESS3-5); **HS.LS1.C** (HS-ESS3-5); **HS.LS2.A** (HS-ESS3-2),(HS-ESS3-3); **HS.LS2.B** (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-6); **HS.LS2.C** (HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); **HS.LS4.D** (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); **HS.ESS2.A** (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-6); **HS.ESS2.D** (HS-ESS3-5); **HS.ESS2.E** (HS-ESS3-3)

*Articulation of DCIs across grade-bands:* **MS.PS1.B** (HS-ESS3-3); **MS.PS3.B** (HS-ESS3-5); **MS.PS3.D** (HS-ESS3-2),(HS-ESS3-5); **MS.LS2.A** (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3); **MS.LS2.B** (HS-ESS3-2),(HS-ESS3-3); **MS.LS2.C** (HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); **MS.LS4.C** (HS-ESS3-3); **MS.LS4.D** (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3); **MS.ESS2.A** (HS-ESS3-1),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6); **MS.ESS2.C** (HS-ESS3-6); **MS.ESS2.D** (HS-ESS3-5); **MS.ESS3.A** (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3); **MS.ESS3.B** (HS-ESS3-1),(HS-ESS3-4),(HS-ESS3-5); **MS.ESS3.C** (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6); **MS.ESS3.D** (HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6)

*Common Core State Standards Connections:*

*ELA/Literacy –*

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| **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. *(HS-ESS3-1)*,(HS-ESS3-2),(HS-ESS3-4),(HS-ESS3-5) |
| **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. *(HS-ESS3-5)* |
| **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. (HS-ESS3-5) |
| **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. (HS-ESS3-2),(HS-ESS3-4) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-ESS3-1) |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. *(HS-ESS3-1)*,(HS-ESS3-2),(HS-ESS3-3),*(HS-ESS3-4)*,(HS-ESS3-5),(HS-ESS3-6) |
| **MP.4** | Model with mathematics. (HS-ESS3-3),(HS-ESS3-6) |
| **HSN-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. *(HS-ESS3-1)*,(HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6) |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. *(HS-ESS3-1),(HS-ESS3-4),(HS-ESS3-5)*,(HS-ESS3-6) |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. *(HS-ESS3-1),(HS-ESS3-4)*,(HS-ESS3-5),(HS-ESS3-6) |

  

# HS-ETS1 Engineering Design

## HS-ETS1 Engineering Design

Students who demonstrate understanding can:

**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.**

**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.**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

### Science and Engineering Practices

**Asking Questions and Defining Problems**
Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.
- Analyze complex real-world problems by specifying criteria and constraints for successful solutions. (HS-ETS1-1)

**Using Mathematics and Computational Thinking**
Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.
- Use mathematical models and/or computer simulations to predict the effects of a design solution on systems and/or the interactions between systems. (HS-ETS1-4)

**Constructing Explanations and Designing Solutions**
Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles and theories.
- Design a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ETS1-2)
- Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ETS1-3)

### Disciplinary Core Ideas

**ETS1.A: Defining and Delimiting Engineering Problems**
- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (HS-ETS1-1)
- Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. (HS-ETS1-1)

**ETS1.B: Developing Possible Solutions**
- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (HS-ETS1-3)
- Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (HS-ETS1-4)

**ETS1.C: Optimizing the Design Solution**
- Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (HS-ETS1-2)

### Crosscutting Concepts

**Systems and System Models**
- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows— within and between systems at different scales. (HS-ETS1-4)

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***Connections to Engineering, Technology, and Applications of Science***

**Influence of Science, Engineering, and Technology on Society and the Natural World**
- New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ETS1-1) (HS-ETS1-3)

*Connections to HS-ETS1.A: Defining and Delimiting Engineering Problems include:*
**Physical Science:** HS-PS2-3, HS-PS3-3
*Connections to HS-ETS1.B: Designing Solutions to Engineering Problems include:*
**Earth and Space Science:** HS-ESS3-2, HS-ESS3-4, **Life Science:** HS-LS2-7, HS-LS4-6
*Connections to HS-ETS1.C: Optimizing the Design Solution include:*
**Physical Science:** HS-PS1-6, HS-PS2-3

*Articulation of DCIs across grade-bands:* **MS.ETS1.A** (HS-ETS1-1),(HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4); **MS.ETS1.B** (HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4); **MS.ETS1.C** (HS-ETS1-2),(HS-ETS1-4)

*Common Core State Standards Connections:*
*ELA/Literacy –*

| | |
|---|---|
| **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. (HS-ETS1-1),*(HS-ETS1-3)* |
| **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. *(HS-ETS1-1)*,(HS-ETS1-3) |
| **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. (HS-ETS1-1),*(HS-ETS1-3)* |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-ETS1-1),*(HS-ETS1-3)*,*(HS-ETS1-4)* |
| **MP.4** | Model with mathematics. (HS-ETS1-1),(HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4) |

# N. Teacher Data Sheet for each Teacher

## Teacher Data Sheet for each Teacher

Copies of all ag teacher's credentials are shown below from the California Commission on Teacher Credentialing. Clarissa Rowley's information does not reflect her move in 2014 to Stanislaus County. All teachers possess a clear single subject credential and a clear ag specialist credential.

**Last Name:** CARDOSO
**First Name:** JESSICA
**Middle Name:** LYNNE

**Last Known County of Employment:** STANISLAUS COUNTY OFFICE OF EDUCATION
**Adverse and Commission Actions Indicator:**

Note: Please verify County of Employment is current
If flag displayed, click the Adverse and Commission Actions tab. If no flag, review Status field under the All Documents tab to view any adverse action taken.

Current Document | All Documents | Adverse and Commission Actions

1 - 2 of 2

| | Document Number | Document Title | Term | Status | Issue Date | Expiration Date | Original Issue Date | Grade | Special Grade |
|---|---|---|---|---|---|---|---|---|---|
| > | 140112813 | Specialist Instruction Credential (Agriculture) | Clear | Valid | 8/1/2014 | 6/1/2017 | 7/13/2009 | | |
| > | 120535280 | Single Subject Teaching Credential | Clear | Valid | 5/1/2012 | 6/1/2017 | 7/13/2009 | | |

Authorization/Subjects

1 - 1 of 1

| Authorization Code | Authorization Description | Subject Code | Subject Description | Major/ Minor | Added Authorization Date |
|---|---|---|---|---|---|
| R3A1 | This credential authorizes the holder to teach agriculture in grades twelve and below, including preschool, and in classes organized primarily for adults. It also authorizes the holder to develop and coordinate curriculum, develop programs, and deliver staff development for agriculture education programs coordinated by school districts or county offices of education. | AGRI | Agriculture | MAJ | |

**Last Name:** MONCRIEF
**First Name:** KENNETH
**Middle Name:** STANLEY

**Last Known County of Employment:** STANISLAUS COUNTY OFFICE OF EDUCATION
**Adverse and Commission Actions Indicator:**

Note: Please verify County of Employment is current
If flag displayed, click the Adverse and Commission Actions tab. If no flag, review Status field under the All Documents tab to view any adverse action taken.

Current Document | All Documents | Adverse and Commission Actions

1 - 3 of 3

| | Document Number | Document Title | Term | Status | Issue Date | Expiration Date | Original Issue Date | Grade | Special Grade |
|---|---|---|---|---|---|---|---|---|---|
| > | 130131622 | Specialist Instruction Credential (Agriculture) | Clear | Valid | 3/1/2013 | 3/1/2018 | 2/8/1988 | | |
| > | 130160163 | Single Subject Teaching Credential | Clear | Valid | 3/1/2013 | 3/1/2018 | 2/8/1988 | | |
| > | L02001105 | Certificate of Completion of Staff Development (Registration only/not a CTC document) | | | 3/13/2002 | | | | |

Authorization/Subjects

1 - 1 of 1

| Authorization Code | Authorization Description | Subject Code | Subject Description | Major/ Minor | Added Authorization Date |
|---|---|---|---|---|---|
| R3A1 | This credential authorizes the holder to teach agriculture in grades twelve and below, including preschool, and in classes organized primarily for adults. It also authorizes the holder to develop and coordinate curriculum, develop programs, and deliver staff development for agriculture education programs coordinated by school districts or county offices of education. | AGRI | Agriculture | MAJ | |

**Last Name:** MORTENSEN
**First Name:** BRIAN
**Middle Name:** SCOTT

**Last Known County of Employment:**
**Adverse and Commission Actions Indicator:**

Note: Please verify County of Employment is current
If flag displayed, click the Adverse and Commission Actions tab. If no flag, review Status field under the All Documents tab to view any adverse action taken.

Current Document | All Documents | Adverse and Commission Actions

1 - 3 of 3

| | Document Number | Document Title | Term | Status | Issue Date | Expiration Date | Original Issue Date | Grade | Special Grade |
|---|---|---|---|---|---|---|---|---|---|
| > | 130106123 | Single Subject Teaching Credential | Clear | Valid | 8/1/2013 | 8/1/2018 | 7/1/2003 | | |
| > | 130106122 | Specialist Instruction Credential (Agriculture) | Clear | Valid | 8/1/2013 | 8/1/2018 | 7/1/2003 | | |
| > | 070297851 | Crosscultural, Language and Academic Development Certificate | Clear | Valid | 3/5/2007 | | 3/5/2007 | | |

Authorization/Subjects

1 - 1 of 1

| Authorization Code | Authorization Description | Subject Code | Subject Description | Major/ Minor | Added Authorization Date |
|---|---|---|---|---|---|
| R1S | This document authorizes the holder to teach the subject area(s) listed in grades twelve and below, including preschool, and in classes organized primarily for adults. | AGRI | Agriculture | MAJ | |

**Last Name:** ROWLEY
**First Name:** CLARISSA
**Middle Name:** MARIE

**Last Known County of Employment:** NEVADA COUNTY OFFICE OF EDUCATION
**Adverse and Commission Actions Indicator:**

Note: Please verify County of Employment is current
If flag displayed, click the Adverse and Commission Actions tab. If no flag, review Status field under the All Documents tab to view any adverse action taken.

Current Document | All Documents | Adverse and Commission Actions

1 - 3 of 3

| | Document Number | Document Title | Term | Status | Issue Date | Expiration Date | Original Issue Date | Grade | Special Grade |
|---|---|---|---|---|---|---|---|---|---|
| › | 130117816 | Single Subject Teaching Credential | Clear | Valid | 6/15/2013 | 7/1/2018 | 5/31/2011 | | |
| › | 110103836 | Single Subject Teaching Credential | Preliminary | Valid | 5/31/2011 | 6/1/2016 | 5/31/2011 | | |
| › | 110103835 | Specialist Instruction Credential (Agriculture) | Clear | Valid | 5/31/2011 | 6/1/2016 | 5/31/2011 | | |

Authorization/Subjects

1 - 2 of 2

| Authorization Code | Authorization Description | Subject Code | Subject Description | Major/ Minor | Added Authorization Date |
|---|---|---|---|---|---|
| ELA1 | The following instructional services may be provided to English learners: (1) instruction for English language development in grades twelve and below, including preschool, and in classes organized primarily for adults. If the prerequisite credential or permit is a designated subjects adult education teaching credential, a child development instructional permit, or a child development supervision permit, English language development instruction is limited to the programs authorized by that credential or permit; (2) specially designed content instruction delivered in English in the subjects, programs and at the grade levels authorized by the prerequisite credential or permit. This English learner authorization also covers classes authorized by other valid, non-emergency credentials or permits held, as specified in Education Code Section 44253.3. | NONE | | | |
| R1S | This document authorizes the holder to teach the subject area(s) listed in grades twelve and below, including preschool, and in classes organized primarily for adults. | AGRI | Agriculture | MAJ | |

**Last Name:** TRAINI
**First Name:** ANTHONY
**Middle Name:** JAMES

**Last Known County of Employment:**
**Adverse and Commission Actions Indicator:**

Note: Please verify County of Employment is current
If flag displayed, click the Adverse and Commission Actions tab. If no flag, review Status field under the All Documents tab to view any adverse action taken.

Current Document | All Documents | Adverse and Commission Actions

1 - 2 of 2

| | Document Number | Document Title | Term | Status | Issue Date | Expiration Date | Original Issue Date | Grade | Special Grade |
|---|---|---|---|---|---|---|---|---|---|
| › | 120549588 | Specialist Instruction Credential (Agriculture) | Clear | Valid | 8/1/2012 | 8/1/2017 | 7/10/2003 | | |
| › | 120549589 | Single Subject Teaching Credential | Clear | Valid | 8/1/2012 | 8/1/2017 | 6/1/2002 | | |

Authorization/Subjects

1 - 1 of 1

| Authorization Code | Authorization Description | Subject Code | Subject Description | Major/ Minor | Added Authorization Date |
|---|---|---|---|---|---|
| R3A1 | This credential authorizes the holder to teach agriculture in grades twelve and below, including preschool, and in classes organized primarily for adults. It also authorizes the holder to develop and coordinate curriculum, develop programs, and deliver staff development for agriculture education programs coordinated by school districts or county offices of education. | AGRI | Agriculture | MAJ | |

# O. Roster of Agriculture Advisory Committee

**Roster of Agriculture Advisory Committee**

Central Valley Agriculture
Advisory Committee

| Names | Address | Phone | Area |
|---|---|---|---|
| Dave Brown | 1560 Ellenwood Rd Waterford 95386 | 538-4353 | Chair |
| | Private Farming | | |
| Don Goudeau | PO Box 1700 Ceres CA 95307 | 531-3127 | Hort |
| | Golden State Seeds | | |
| Steve Haglund | 5560 W Keys Modesto CA 95258 | 538-2509 | Asci |
| | Farmers Livestock Market | | |
| Troy Gravatt | 435 College Modesto CA 95350 | 575-6212 | MJC |
| | Instructor | | |
| Clarissa Rowley | PO Box 307 Ceres CA 95307 | 556-1900 | Ag Dept |
| | CVHS Teacher | | |
| Ken Moncrief | PO Box 307 Ceres CA 95307 | 556-1900 | Ag Dept |
| | CVHS Horticulture Teacher | | |
| Tony Traini | PO Box 307 Ceres CA 95307 | 556-1900 | Power Mech |
| | Power Mech | | |
| Brian Mortensen | PO Box 307 Ceres CA 95307 | 556-1900 | Floral |
| | CVHS Welding | | |
| Jessica Cardoso | PO Box 307 Ceres CA 95307 | 556-1900 | Ag Science |
| | CVHS AG SCI | | Dept Chair |
| Mike James | PO Box 307 Ceres CA 95307 | 538-0158 | Jr. High Ag |
| Jay Simmons | PO Box 307 Ceres CA 95307 | 538-0150 | Vo Ed Dir |
| Scott Long | 4801 E. Whitmore Ceres CA 95307 | 538-1166 | Tree Crops |
| | Superior Fruit Ranch | | |
| Dan Graham | 5536 S Carpenter Modesto CA 95358 | 538-7468 | Dairy |
| | Midland Dairy | 595-6785 cell | |
| Doug Bougla | 420 River Rd Modesto CA 95351 | | Welding |
| | Praxair Welding Supply | | |
| Scott Campbell | 1501 Coldwell Ave Modesto CA 95350 | | Welding |
| | Barnes Welding Supply | 491-2780 | |
| Daniel Moniz | 1295 N Emerald Ave Ste S Modesto CA 95351 | | |
| | Power Equipment – HG Makelim | 650-827-7531 | |
| Darol Watts | 2704 Railroad Ave Ceres CA 95307 | 571-6400 | Welding |
| | West Mark | | |
| Mike Grover | 2825 Kiernan Ave Modesto, CA 95356 | 209-545-4401 | Lands |
| | Grover Landscape | | |

# P. Advisory Committee Minutes

## Advisory Committee Minutes

Central Valley Ag Department is working this year to update our advisory committee members and improve its focus and function. These are the last meeting minutes we have from September 2014. We have met with advisory committee members since then but the meeting had no minutes and did not include all members. This revision year will include 2 advisory meetings and next school year (2016-2017) will include 3 meetings.
Called to order at 6:04 by Ken Moncrief.

Agenda Items
1. Farm Update
   - Moncrief's classes using the farm on a regular basis; helps student learn where their food comes from.
   - Since school started: harvested grapes, cherry tomatoes, large tomatoes, lettuce in greenhouse, pluots & peaches, & peppers
     - $5501.28 to child nutrition program; Pretty much paid off debt to Child Nutrition for their loan
   - Building is up! Will be putting trim on it this weekend
   - District is working on getting power & a working bathroom (septic tank was installed during Summer); exploring getting its own alarm system
   - Fence finally up to protect from theft (over $10,000 in equipment has been stolen from farm with torches and bold cutters)
     - Suggested to get a legitimate alarm system that someone will DEFINITELY respond to if set off

2. Needs for Farm
   - Support with weed management! Purchase of new bed shaper will help because of plastic; tried to avoid chemical control, but weeds are out of control (especially pigweed & lambs quarters)
     - Fumigations? What does the permit allow?
     - Call Ray Ratto; talk to Farm Supply
     - Get pads done, & fields lazered
     - Get price quote & group will get $$ to get it done
   - Trying to get district to replace outdated tractor
   - Completing last aspects of building – getting electrical from elementary ($25,000 to get its own system & transformer; pull wire from main panel on Hidal to bring it to farm) Done by district architect.
     - Suggested to check with TID engineer for a quote & suggestions on how to run it; especially if ag dept is writing the check & not the district
     - Check on aluminum instead of copper because of price
     - A bunch of wire size vs transformer size discussion; a lot of numbers are being thrown around right now about wire sizes and phases and amps & I wish knew anything about electrical systems so I can figure out what's going on; if you want to know details ask one of the shop teachers
     - Is 200 amps necessary? Suggested that 200 amps should be plenty; probably will not need it but its better to be safe

        - Might be cheaper to go with bigger wire that with a 440 transformer just for smaller wire
    - Next phase = swine barn! We have outgrown the old one and need a new facility.

3. Plan for Dedication and Fundraising
    - December 6th event to recognize individuals who have helped fund the process so far; omelet breakfast to thank but also get people in the seats to help support us for the rest of it.
    - Will also showcase areas in the ag departments (greenhouse, poultry unit, ag mechanics, etc) via posters
    - Hook them by getting them to the event & see what we are doing out there & hopefully getting them to support!
    - What would be the best way to contact supporters?
        - Alumni – supportive because their connection to program
        - Kids can go ask but advisors really need to promote especially when it comes to money
        - Personal phone calls or meetings; but flyers to leave with them
        - Advisory group help create a contact list & help with follow up calls if necessary (maybe pre-call & then transfer to ag advisors; someone to open the door!)
            - Wayne Zipser (?)
            - Gallo; Fosters; JS West; Farm Bureau
            - Lions; Rotary
        - Suggested to put prices of what you need so they can see numbers of what is needed; higher chances of actually supporting
        - Need to SELL the pig barn with a story! Good project to get started & then they can show something bigger (like dairy – dairymen would like that)
        - Livestock Facilities in Phases & make sure that is clear to potential supporters (Phase 1 veggies, Phase 2 swine barn, Phase 3 beef & sheep barn)
        - Break up the barn: one guy to do the floor, one to do the ….
        - Challenge to group: go home, make a list & email it to Ken; Ken will make a complete list, email it out, & group will make calls based on personal connections
        - Farm Bureau newsletter
        - Full article explain the event & its purpose in Courier or Bee (John Holland writes the ag articles)
        - Pictures of the kids (visuals!)
    - How do you handle waste water?
        - Elementary school on septic tank
        - Estimated 2000-3000 gallons per week during peak season currently
        - Haul it off? Pasture area?
        - Need to monitor water usage
        - Change mister/sprinkler set up on an automatic timer to use less water
        - Contained septic tank – cement basin covered with pump
        - Septic tanks are great but expensive
        - Do not use a leach field!
        - Put solids in a compost spot
        - Odor will be biggest factor to deal with! Odor = no bueno!

- Run barn dry for first year? Need to be able shovel waste out of shovel-width gutter
- Put a meter on it to give you an idea of what you're using
- Make gutter 16" deep so you have volume. Put tank on end to catch excess water/solids; shovel out what you can & rest will go to septic; or create a series to septic to get the solids out & put excess water on pasture
- Security will have to be a high priority especially when live animals are there (since theft has been a recent issue already without animals)
- Turn out fresh water on field the same time as manure water to dilute
- Offer to come out & look at pig barn to see how facilities are set up to get inspiration

Other thoughts:

- December 6th – is it doable in 90 days?
  - Budgets are coming out soon; people need to know if they are going to spend $$
- Date set for Tuesday September 30th at 3:00pm to visit ag center
- Possible for someone to bring a crew out & complete construction? YES!

Adjourned at 7:45ish

# Q. Current Year Budget

## Current Year Budget

FFA Budget

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Central Valley High School | | | | | | |
| | Budget for 2015- 2016 | | | | | | |
| | Club Sport : Central Valley FFA | | | | | | |
| | | | | | | | |
| Description | Expense | | Description | Income | | | |
| Conferences | 5953 | | Conferences | 4171 | | | |
| Food & Supplies | 8358.1 | | Food & supplies | 11385 | | | |
| Contests | 2191.8 | | Contests | 376.72 | | | |
| Floral Supply | 4811.8 | | Floral | 3011 | | | |
| Fair | 8714.3 | | Fair | 8168.5 | | | |
| Misc (section dues, shirts, grad plants) | 1376 | | Misc (shirts, donations) | 2975.5 | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Total | 31405 | | | 30088 | | -1317 | Net |

# R. Signed Articulation Agreement and/or Evidence of Articulation

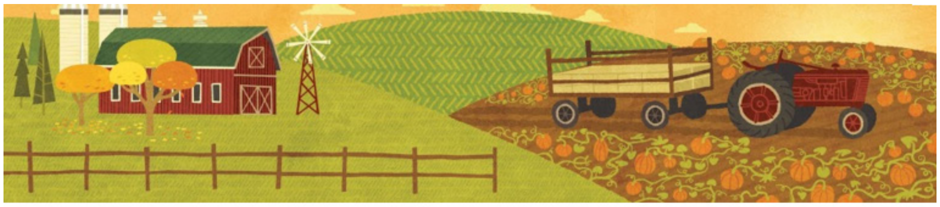
## Signed Articulation Agreement and/or Evidence of Articulation

Central Valley Ag Department does not currently have any classes articulated with Modesto Junior College. In the past we have had 2+2 articulation for Floriculture and Animal Science courses. We will be working, beginning in December 2015 to articulate Vet Science, Advanced Floriculture, and Power Mechanics with MJC.

# S. Graduate
# Follow-Up System

## Graduate Follow-Up System

Central Valley has never used a graduate follow-up system to survey students. Beginning May 2015, there will be a graduate survey completed by all seniors in the department. Below is a copy of the Google Forms survey and a screen shot of the data table that will collect the responses. Responses will be analyzed at the department summer retreat in June to help plan for the following year.



# Central Valley Ag Department Graduate Follow-up

Your username (**jcardoso@ceresusd.net**) will be recorded when you submit this form.
Not **jcardoso**? Sign out
* Required

### What will you plans be for after you graduate high school? *

- [ ] Attending 4 year university
- [ ] Attending 2 year college (community or junior college)
- [ ] Trade school
- [ ] Military
- [ ] Working Full Time
- [ ] Working Part Time
- [ ] Not Working
- [ ] Other:

### If attending college or university, is your major ag related?

### If working, what type of business or industry are you employed?

please also include your job title

### Which statement best applies to your present occupation? *

### How would you rate training received in the agriculture program? *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| poor | ○ | ○ | ○ | ○ | ○ | excellent |

### How would you rate the career guidance and counseling you received in the agriculture program? *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| poor | ○ | ○ | ○ | ○ | ○ | excellent |

### Please check the following areas you feel are valuable components of FFA. *

- ☐ officer and committee chairman experience
- ☐ judging teams and contests
- ☐ advanced degree and proficiency awards
- ☐ participation in chapter activities, working with others
- ☐ livestock raising, shows, fairs, ect.
- ☐ Other:

### What were the most valuable aspects of the SAE projects? *

choose all that apply.

- ☐ Learning skills related to future ag employment
- ☐ Development of responsibility
- ☐ learning record keeping
- ☐ Other:

### Please rate the facilities in the agriculture program *

check all that apply.

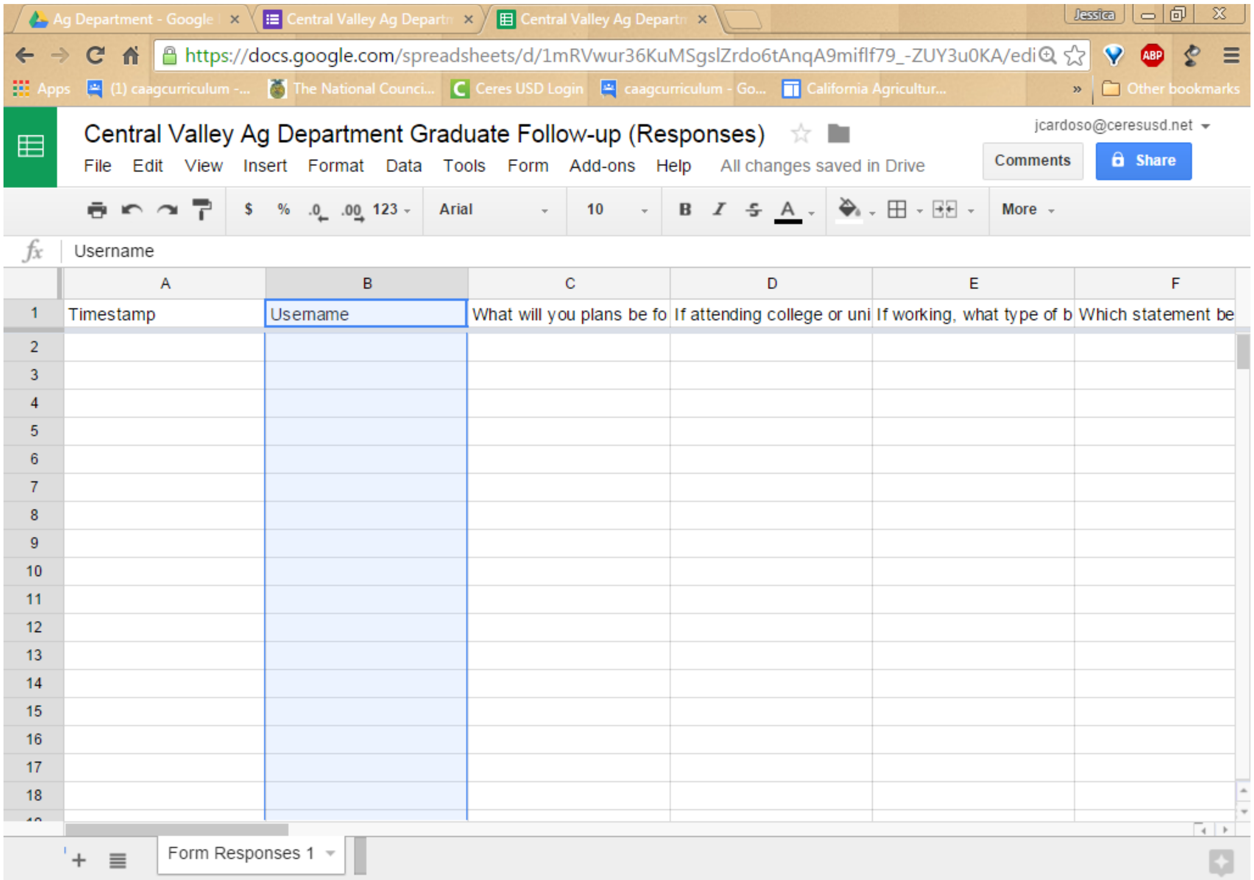
- ☐ overcrowded
- ☐ modern
- ☐ adequate space provided
- ☐ out of date
- ☐ Other:

### Please rate the equipment in the agriculture program. *

choose all that apply

- ☐ modern
- ☐ well-maintained
- ☐ adequate amount of equipment for all students
- ☐ out of date
- ☐ poorly maintained
- ☐ Other:

### Please note any suggestions you have for improving the instructional program, including classroom, shop, greenhouse, school farm, FFA, SAE, teaching methods used, facilities/ equipment.



Ag Department - Google
Central Valley Ag Departn
Central Valley Ag Departn
https://docs.google.com/spreadsheets/d/1mRVwur36KuMSgslZrdo6tAnqA9miflf79_-ZUY3u0KA/edi
Apps
(1) caagcurriculum -...
The National Counci...
Ceres USD Login
caagcurriculum - Go...
California Agricultur...
Other bookmarks
Central Valley Ag Department Graduate Follow-up (Responses)
jcardoso@ceresusd.net
File
Edit
View
Insert
Format
Data
Tools
Form
Add-ons
Help
All changes saved in Drive
Comments
Share
Arial
10
More
Username
Timestamp
Username
What will you plans be fo
If attending college or uni
If working, what type of b
Which statement be
Form Responses 1

# T. List of Active Placement Sites

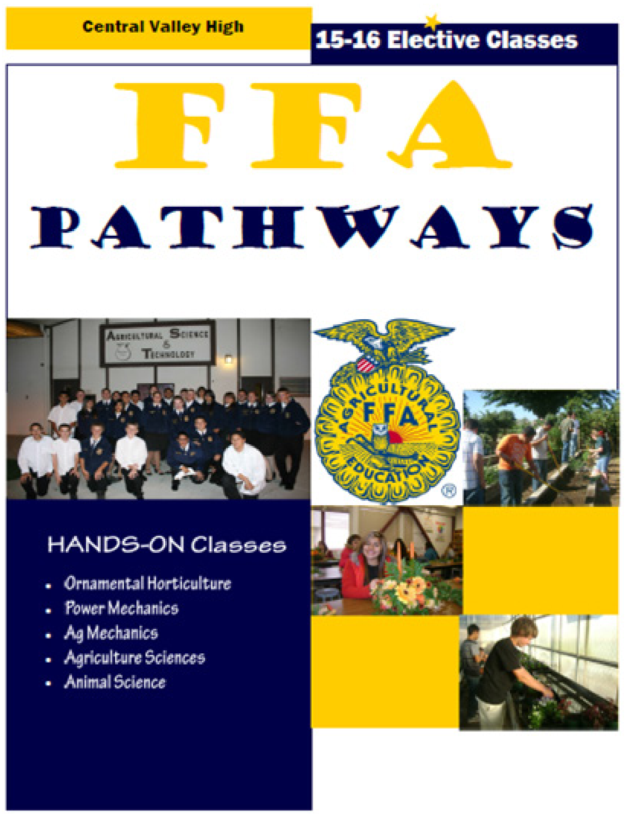
## List of Active Placement Sites

Central Valley does not currently have a list of active placement sites outside the department's Cooperative Rabbitry and Pumpkin Cooperative. It is very difficult for students to find employment outside family businesses under the age of 18 due to labor insurance regulations.

# U. Recruitment Activities and Materials

## Recruitment Activities and Materials

Central Valley Agriculture Department has always had a comprehensive recruitment process. Over the past 2 years this has been evolving based on the classes we are offering to each level. Eighth graders from feeder high schools visit the high school in January where one of the ag teachers will present introductory level classes. We used to present all the courses we offer but have since grown too large for the time frame given to present. All ag teachers also present to every ag classes in the Professional Development Room on campus about each course we teach in the department as a form of whole program recruitment and retention. We have also set up rotational presentations and visits for the ag biology students to explore electives they could take. We are now considering instituting an ag chem rotation to get sophomores into ag electives their junior year.




# V. Staff In-Service Record

## Staff In-service Record

### INCENTIVE GRANT IN-SERVICE ACTIVITIES DOCUMENTATION

*CRITERIA 4.B* **School Year** 14-15 **School** **Central Valley High School**

Based on the previous year's record, every agriculture teacher, teaching at least ½ time agriculture, attends a minimum of four of the following professional development activities:

Qualified and Competent Personnel

| ACTIVITIES | TEACHERS NAMES | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Cardoso | Moncrief | Mortensen | Rowley | Traini | | | |
| Fall Region Meeting | X | X | X | X | X | | | |
| Region In-service Day | X | X | X | X | X | | | |
| Spring Region Meeting | X | X | X | X | | | | |
| Section In-service* | X | X | X | X | X | | | |
| Section In-service* | X | X | X | X | X | | | |
| Section In-service* | X | | | | X | | | |
| Section In-service* | X | X | X | X | X | | | |
| Summer Conference | X | X | X | X | X | | | |
| University AgEd Skills Week | X | | X | X | X | | | |
| Professional Development ** | | | | | | | | |

* Four Section In-service Meetings equals one Professional Development Activity

** Can utilize a *maximum* of two other *"Agriculturally Related"* Professional Development activities than those listed above. Explain the Professional Development:

1
2
3
4
5

**Appendix M: Advisory Committee Agendas and Minutes**
Central Valley Ag Department is working this year to update our advisory committee members and improve its focus and function. These are the last meeting minutes we have from September 2014. We have met with advisory committee members since then but the meeting had no minutes and did not include all members. This revision year will include 2 advisory meetings and next school year (2016-2017) will include 3 meetings.

Central Valley Agriculture
Advisory Committee

| Names | Address | Phone | Area |
|---|---|---|---|
| Dave Brown | 1560 Ellenwood Rd Waterford 95386<br>Private Farming | 538-4353 | Chair |
| Don Goudeau | PO Box 1700 Ceres CA 95307<br>Golden State Seeds | 531-3127 | Hort |
| Steve Haglund | 5560 W Keys Modesto CA 95258<br>Farmers Livestock Market | 538-2509 | Asci |
| Troy Gravatt | 435 College Modesto CA 95350<br>Instructor | 575-6212 | MJC |
| Clarissa Rowley | PO Box 307 Ceres CA 95307<br>CVHS Teacher | 556-1900 | Ag Dept |
| Ken Moncrief | PO Box 307 Ceres CA 95307<br>CVHS Horticulture Teacher | 556-1900 | Ag Dept |
| Tony Traini | PO Box 307 Ceres CA 95307<br>Power Mech | 556-1900 | Power Mech |
| Brian Mortensen | PO Box 307 Ceres CA 95307<br>CVHS Welding | 556-1900 | Floral |
| Jessica Cardoso | PO Box 307 Ceres CA 95307<br>CVHS AG SCI | 556-1900 | Ag Science<br>Dept Chair |
| Mike James | PO Box 307 Ceres CA 95307 | 538-0158 | Jr. High Ag |
| Jay Simmons | PO Box 307 Ceres CA 95307 | 538-0150 | Vo Ed Dir |
| Scott Long | 4801 E. Whitmore Ceres CA 95307<br>Superior Fruit Ranch | 538-1166 | Tree Crops |
| Dan Graham | 5536 S Carpenter Modesto CA 95358<br>Midland Dairy | 538-7468<br>595-6785 cell | Dairy |
| Doug Bougla | 420 River Rd Modesto CA 95351<br>Praxair Welding Supply | | Welding |
| Scott Campbell | 1501 Coldwell Ave Modesto CA 95350<br>Barnes Welding Supply | 491-2780 | Welding |
| Daniel Moniz | 1295 N Emerald Ave Ste S Modesto CA 95351<br>Power Equipment – HG Makelim | 650-827-7531 | |
| Darol Watts | 2704 Railroad Ave Ceres CA 95307<br>West Mark | 571-6400 | Welding |
| Mike Grover | 2825 Kiernan Ave Modesto, CA 95356<br>Landscape | 209-545-4401 | Lands Grover |

3/20/13 Advisory Committee meeting

Ken Moncrief introduction
Marlen Diaz
Ernesto Cuevas
Jay Simmonds
Nicole Chapman
Dave Brown
Don Goudeau
Jared Penfold
John Bailey
Kaitlin
Trunbow
Britty Turn Bow

Tony Traini
Kyle Van Vooren
Alyssa Hatchinson

Brian Mortensen
Heather Adney
Mardel Runnels
Mike Patterson

Jessi Bishop explained packets (add detail here)

Ken explained the background on the farm and what has happened in the past year and a half.
Irrigation water and plumbing
Land is un level, utilitzing drip irrigation
130 fruit trees dave wilson
200 table grapes Duarte nursery and kyle and greg vanvooren
Toro irrigation donated most irrigation
Built our own bed shaper
Row crops, pumpkins
2000 produce entries at fair and into school lunches
Hydroponics greenhouse 1600 heads of lettuce on CV campus

Committee is focused on build other facilities and helping us prepare to speak with CEOs and other funding sources

Committee critiques student (mock presentation)
Do you have any idea how long this project will take to complete?
    With the proper funding, hopefully 1 year
Is there an avenue set up for me to donate a smaller amount over the course of years rather than one lump sum?

Stress that ceres kids are not directly involved with farming and this project will give them a better feel of ag and they are the future voters
Great opportunity for kids to get experience on a farm

When you shake had give them your name
Don't ask for money or for a decision that day

Recognize who the person is, know their background
Recognize their role in the community

Use number ex 85% of your students are non ag students

Industry needs to know that these are kid either get the ag experience here or not at all

Business cards for the presenters with FFA logo
Stress that this is a way to get younger people involved and informed about their industry
Emphasize that this is food going into school lunches

Talk about
Talk about donation levels as well as any donation is acceptable, as well as in kind donations would be welcome as well

Flexible donation levels

Set a target time to kick this off and once you get some seed money to get a large article in the courier or modesto bee.

Sue nuwicky? From modesto bee

Show them all the levels of sponsorship don't call all of them foundation levels

Run it by the art dept and English dept for extra polish

Can this project some how go into a designated fund that assures donors that 100% of their money goes toward the farm projects.

Ceres unified Ag Center to be the name on the donation

Recognition of individuals is good with bricks, still would like to show every donation choice to donors
Have an idea of who to talk to and what your expectation is from them.

Tri fold brochure with 3 levels of suggested sponsorship
Separate paper for order form

Pictures online to refer to during the presentation
Get pictures of kids eating food

Field trip ag day at farm, send kids home with pamphlet about ag center and get parents excited about it.

In presentation, talk about donating to a food bank and talk about how you will be helping the community not just profiting from sales.

Facility talks

Facilty footprint

Elevation and floorplan architecture plans

Jay Simmonds and Scott Long are concerned about the prevailing north west wind coming along and the smell traveling over the Hidahl school campus

John Bailey- keep it clean and low concentration of pigs will have a relatively low smell
Larger collection pond with less water (no flush system) will also help with smell.
Design the facility differently to bed the pigs and compost the dry product and use for fertilizer (flies are a concern with that)

Current fam facility produces about 1000 gallons of waste water a week
New facility will project about 5000 gallons a week during peak production
    How big? Lined or unlined? Cost?
What is the projects livestock project numbers?
    15-20 pigs, 7-15 sheep, 5-10 head of cattle

Can we make the pasture bigger to take the water?
    Yes, absolutely. Whatever is needed to deal with the waste water will be available

Suggested floor plan oriented east west and cattle and sheep pens back to back more cost efficient
Metal roof and siding, no wood or paint
Is there sun or heat concerns with this different orientation
12 minimum height on ceilings, 16' better
Raised center roof on cattle and sheep barns
If they tell you you need 6" rise, build it a foot high
Total floor size 40 x100 to 30x80

Better floor plan teaching so people can be under cover

Feed storage and hay storage
Concrete and cover with dirt to give animals clean and dry

Manteca and MJC facilities worth looking at

Designate barns as beef and dairy not cattle

Need to get finalized estimated costs before finalized sponsorship flyer so we don't look like we're guessing

_______

Farm Advisory Meeting 11/20/14
Updates:
Sign is in the process of being constructed and should be ready for that night
Other donor signs will be ready as well
District will connect water to sink in building
Tables and chairs will be borrowed from the district
    Don will get a roll of plastic table covering
Day of the event
    9-10 build your own omelet
    JS West eggs, boosters the rest of food
10 presentation time- story of facility and supporters, touch on things still doing, give cost breakdown on electrical
    Are we going to have a prioritized list breakdown for people to help with.
    Swine barn plan will most likely not be available
    Heat for the building?

    Board member support? Dave says we should ask for money.
Emphasize that its tax deductible, end of the year, better place to put your money rather than pay it to the government.
    Contact the courier about an article in the paper before the event.
    Dave volunteered to get at least one port-a-potty for the day

___________

Agriculture Advisory Meeting
September 25, 2014
Central Valley High School

Called to order at 6:04 by Ken Moncrief.

Agenda Items
1. Farm Update
- Moncrief's classes using the farm on a regular basis; helps student learn where their food comes from.
- Since school started: harvested grapes, cherry tomatoes, large tomatoes, lettuce in greenhouse, pluots & peaches, & peppers
    - $5501.28 to child nutrition program; Pretty much paid off debt to Child Nutrition for their loan
- Building is up! Will be putting trim on it this weekend
- District is working on getting power & a working bathroom (septic tank was installed during Summer); exploring getting its own alarm system
- Fence finally up to protect from theft (over $10,000 in equipment has been stolen from farm with torches and bold cutters)

    - Suggested to get a legitimate alarm system that someone will DEFINITELY respond to if set off

2. Needs for Farm
   - Support with weed management! Purchase of new bed shaper will help because of plastic; tried to avoid chemical control, but weeds are out of control (especially pigweed & lambs quarters)
     - Fumigations? What does the permit allow?
     - Call Ray Ratto; talk to Farm Supply
     - Get pads done, & fields lazered
     - Get price quote & group will get $$ to get it done
   - Trying to get district to replace outdated tractor
   - Completing last aspects of building – getting electrical from elementary ($25,000 to get its own system & transformer; pull wire from main panel on Hidal to bring it to farm) Done by district architect.
     - Suggested to check with TID engineer for a quote & suggestions on how to run it; especially if ag dept is writing the check & not the district
     - Check on aluminum instead of copper because of price
     - Is 200 amps necessary? Suggested that 200 amps should be plenty; probably will not need it but its better to be safe
     - Might be cheaper to go with bigger wire that with a 440 transformer just for smaller wire
   - Next phase = swine barn! We have outgrown the old one and need a new facility.
3. Plan for Dedication and Fundraising
   - December 6th event to recognize individuals who have helped fund the process so far; omelet breakfast to thank but also get people in the seats to help support us for the rest of it.
   - Will also showcase areas in the ag departments (greenhouse, poultry unit, ag mechanics, etc) via posters
   - Hook them by getting them to the event & see what we are doing out there & hopefully getting them to support!
   - What would be the best way to contact supporters?
     - Alumni – supportive because their connection to program
     - Kids can go ask but advisors really need to promote especially when it comes to money
     - Personal phone calls or meetings; but flyers to leave with them
     - Advisory group help create a contact list & help with follow up calls if necessary (maybe pre-call & then transfer to ag advisors; someone to open the door!)
       - Wayne Zipser (?)
       - Gallo; Fosters; JS West; Farm Bureau
       - Lions; Rotary
     - Suggested to put prices of what you need so they can see numbers of what is needed; higher chances of actually supporting
     - Need to SELL the pig barn with a story! Good project to get started & then they can show something bigger (like dairy – dairymen would like that)
     - Livestock Facilities in Phases & make sure that is clear to potential supporters (Phase 1 veggies, Phase 2 swine barn, Phase 3 beef & sheep barn)

- Break up the barn: one guy to do the floor, one to do the ….
- Challenge to group: go home, make a list & email it to Ken; Ken will make a complete list, email it out, & group will make calls based on personal connections
- Farm Bureau newsletter
- Full article explain the event & its purpose in Courier or Bee (John Holland writes the ag articles)
- Pictures of the kids (visuals!)

- How do you handle waste water?
  - Elementary school on septic tank
  - Estimated 2000-3000 gallons per week during peak season currently
  - Haul it off? Pasture area?
  - Need to monitor water usage
  - Change mister/sprinkler set up on an automatic timer to use less water
  - Contained septic tank – cement basin covered with pump
  - Septic tanks are great but expensive
  - Do not use a leach field!
  - Put solids in a compost spot
  - Odor will be biggest factor to deal with!
  - Run barn dry for first year? Need to be able shovel waste out of shovel-width gutter
  - Put a meter on it to give you an idea of what you're using
  - Make gutter 16" deep so you have volume. Put tank on end to catch excess water/solids; shovel out what you can & rest will go to septic; or create a series to septic to get the solids out & put excess water on pasture
  - Security will have to be a high priority especially when live animals are there (since theft has been a recent issue already without animals)
  - Turn out fresh water on field the same time as manure water to dilute
  - Offer to come out & look at pig barn to see how facilities are set up to get inspiration

Other thoughts:

- December 6th – is it doable in 90 days?
  - Budgets are coming out soon; people need to know if they are going to spend $$
- Date set for Tuesday September 30th at 3:00pm to visit ag center
- Possible for someone to bring a crew out & complete construction? YES!

Adjourned at 7:45

## Appendix N: Advisory Committee Constitution and By-Laws

As previously stated, the advisory committee in form and function is reforming this year and does not currently have a constitution or by-laws. I have not found a record of any previous by-laws or constitution to build from so we will have to develop our own.

**Appendix O: Proficiency Standards**

Central Valley Agriculture Department developed its own course expected outcomes in 2014 to create continuity between pathway courses. This is mainly focused on the agriculture CTE standards however a focus of our school in the past 2 years has been to incorporate Literacy Standards for science and technical subjects, California Common Core Standards, and in Agriscience, Next Generation Science Standards.

**Course Expected Outcomes**

Developed 2013-2014 school year. Do not reflect 2015-16 and 2016-2017 course changes.

**Ag Mechanics Pathway**

Intro to Ag Mechanics

57. FFA and California Agriculture
58. Measurement
59. Tool ID
60. Shop safety/ procedures
61. Tie 8 knots and 3 splices
62. Sheet metal layout and fabrication
63. Pipe joints for steel, copper, and PVC and common fittings used
64. Fabrication of cold metal and fasteners used to join them
65. Wiring a basic circuit and principle of electricity
66. Wood layout and fabrication of wood joints
67. Basic plan reading
68. Basic bill of materials
69. Basic layout
70. Introduction to welding

Intro to Ag Welding

33. Demonstrate safe shop procedures and machinery operation.
34. Apply oxy-acetylene cutting theory to cut, pierce, and bevel steel.
35. Safely set-up and cut using the plasma arc machine.
36. Set-up, adjust, and weld correctly using SMAW in the flat and vertical positions using 6011,6013, and 7018 rods.
37. Set-up, adjust, and weld correctly using GMAW in the flat and vertical positions.
38. Properly layout and cut using CAD plans.
39. Fabricate a project that is structurally square and stable.
40. Create a bill of materials after project completion.

ROP Welding

21. Apply SMAW out of position using 6011 7018
22. Apply GMAW out of position
23. Set-up, adjust, and weld using TIG welding
24. Apply metal processing of oxy-acetylene and plasma to cut metal
25. Demonstrate project construction and structural design principles

ROP Welding Fabrication

5. Construct projects using SMAW, GMAW, TIG, and Oxy- Acetylene welding

**Power Mechanics Pathway**

Intro to Ag Mechanics

53. FFA and California Agriculture
54. Measurement
55. Tool ID
56. Shop safety/ procedures
57. Tie 8 knots and 3 splices
58. Sheet metal layout and fabrication
59. Pipe joints for steel, copper, and PVC and common fittings used
60. Fabrication of cold metal and fasteners used to join them
61. Wiring a basic circuit and principle of electricity
62. Wood layout and fabrication of wood joints
63. Basic plan reading
64. Basic bill of materials
65. Basic layout

Intro to Ag Welding

33. Demonstrate safe shop procedures and machinery operation.
34. Apply oxy-acetylene cutting theory to cut, pierce, and bevel steel.
35. Safely set-up and cut using the plasma arc machine.
36. Set-up, adjust, and weld correctly using SMAW in the flat and vertical positions using 6011,6013, and 7018 rods.
37. Set-up, adjust, and weld correctly using GMAW in the flat and vertical positions.
38. Properly layout and cut using CAD plans.
39. Fabricate a project that is structurally square and stable.
40. Create a bill of materials after project completion.

Intro to Power Mechanics

37. Use Micrometers
38. 3 engine systems: ignition, carburetion, compression
39. Torque
40. Read technical writing
41. Basic parts ID
42. Use manual to look up part numbers
43. Basic tool ID
44. Basic cold metal fabrication
45. Basic engine overhaul

ROP Power Mechanics

33. Perform a complete engine overhaul
34. Look up part numbers using the mechanics manual
35. Complete work orders

36. Engine diagnostics and trouble shooting
37. Advanced tool ID
38. Basic part fabrication
39. Use diagnostic equipment
40. Use torch wrench

**Ornamental Horticulture**

Intro to Plant Production

37. FFA and California Agriculture
38. Equipment safety
39. Plant propagation- sexual and asexual
40. Plant nutrition- macro and micro nutrients, organic and inorganic
41. Weed Control and identification- cultural and chemical
42. Pest Control and ID- organic and inorganic methods
43. Plant management- pruning, training, and harvest
44. Safe food handling- harvest, production, process, and storage
45. Disease control- prevention and treatment

ROP Intro to Floriculture

33. FFA and California Agriculture
34. Safe handling of floral sheers and knife
35. Identify 20 flowers, 20 potted plants, 20 tools
36. Construct a boutonnière
37. Construct a corsage
38. Construct a centerpiece arrangement
39. Complete a floral arrangement price sheet
40. Understand color concepts

Advanced Plant Production

33. Equipment operation- cultivate, bed preparation, mower, edger, blower
34. Apply Plant propagation- sexual and asexual
35. Apply Plant nutrition- macro and micro nutrients, organic and inorganic
36. Apply Weed Control and identification- cultural and chemical
37. Apply Pest Control and ID- organic and inorganic methods
38. Apply Plant management- pruning, training, and harvest
39. Apply Safe food handling- harvest, production, process, and storage
40. Apply Disease control- prevention and treatment

ROP Ag Advanced Floriculture

37. Safely handle tools
38. Identify all cut flowers, potted plants, and tools
39. Construct various artistic arrangements
40. Apply color concepts
41. Contemporary design styles and techniques
42. Complete retail and labor cost sheets

43. Peer and self analyze arrangements
44. Understand historical and cultural theory
45. Evaluate floral artwork

**Animal Science Pathway**

Intro to Animal Agriculture
49. FFA and California Agriculture
50. Breeds- beef, sheep, swine, horse, chickens, dairy, dairy goats
51. Terminology
52. Digestive systems- ruminant, mono-gastric, and poultry
53. Grooming
54. Housing and equipment
55. Animal safety
56. Segments of the livestock industry
57. California agriculture and meats
58. Restraints
59. Animal identification
60. Basic external anatomy

Animal Science
37. Digestive systems and processes
38. Injection types- IM, IV, IR, Subcutaneous, intradermal
39. Animal Marketing- meat, mohair, wool, by products
40. Selection of animals
41. Showing
42. Basic animal husbandry
43. Nutrition and feeding
44. Reproduction and breeding
45. Genetics

Vet Science
33. Diseases of Livestock
34. Ethics and ethical treatment of public animals
35. Administration of medications
36. Medical examinations/ wound management
37. Fecal and urine samples
38. Anatomy and physiology
39. Animal behaviors
40. Surgical Instruments

**Agriculture Sciences**

Ag Chemistry
37. Know the parts of the atom, its density, and how atoms are arranged on the periodic table
38. Know chemical bonding and how it applies to chemical reactions

39. Be able to balance chemical equations
40. Apply gas laws to specific situations
41. Understand principles of solutions and molarity for purposes of developing different concentrations
42. Apply acid and base knowledge to solutions for plant and animal health
43. Know nuclear chemistry and how matter affects it
44. Apply biochemistry to food production
45. Agriscience Fair emphasis on experimental design

Ag Biology

29. Cell organization and processes
30. Reproduction of plants and animals
31. Genetics
32. Evolution
33. Physiology of plants and animals
34. Ecology
35. Investigation and experimentation

Advanced Ag Biology

33. Agriscience Fair emphasis on experimental design
34. Cell organization and processes
35. Reproduction of plants and animals
36. Genetics
37. Evolution
38. Physiology of plants and animals
39. Ecology
40. Investigation and experimentation

**<u>California CTE Standards</u>**
**Agriculture and Natural Resources Industry Sector**

**A. Agricultural Business Pathway**

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

A1.0 Students understand decision-making processes within the American free enterprise system:
A1.1 Differentiate among the components of the American free enterprise system and other forms of economic systems.
A1.2 Distinguish among the main characteristics of individual proprietorships, partnerships, corporations, and cooperatives.
A1.3 Understand the advantages and disadvantages of the four types of business ownership.
A1.4 Analyze appropriate decision-making tools and financial records to make key

management decisions.
A1.5 Analyze physical production relationships to determine optimum use levels.
A1.6 Understand how to calculate the fixed and variable costs associated with the production of agricultural products and determine the output level that will yield maximum profit.
A2.0 Students understand the fundamental economic principles of agribusiness and agricultural production:
A2.1 Understand how basic economic factors affect agricultural production and agribusiness management decisions.
A2.2 Know basic agricultural economic terminology.
A2.3 Understand the law of supply and demand as it effects price determination.
A2.4 Analyze how agriculture uses scarce resources to meet the needs and demands of its consumers.
A2.5 Differentiate between elastic and inelastic supply and demand.
A2.6 Understand the law of diminishing returns and its impact on agricultural production.
A3.0 Students understand the role of credit in agribusiness and agricultural production:
A3.1 Analyze the factors that determine the cost of credit in order to select optimum credit sources (e.g., the advantages and disadvantages of borrowing from the various types of credit providers and sources for short-, intermediate-, and long-term credit).
A3.2 Know the criteria lenders use to evaluate repayment capacity.
A3.3 Analyze balance sheets and cash-flow statements to determine the ability to repay loans.
A4.0 Students understand proper accounting principles and procedures used in business management and tax planning:
A4.1 Understand the differences between cash and accrual accounting systems.
A4.2 Understand the use and importance of budgets, income statements, balance sheets, and financial statements.
A4.3 Understand the basis of taxation within the tax system and its impact on the economy, including the role of taxes in agribusiness.
A4.4 Analyze the role of depreciation and purchasing in tax planning and liability.
A4.5 Understand how to determine property values and how to complete a depreciation schedule.
A4.6 Understand how to determine the tax obligations for an agribusiness.
A5.0 Students understand basic risk management principles and their impact on economic viability:
A5.1 Understand environmental responsibility and its impact on agribusiness.
A5.2 Understand the concept of liability and the economic impact of being held liable.
A5.3 Understand the concept and process of risk management, including the use of risk management tools such as insurance.
A5.4 Understand how recordkeeping, farm plans, and an analysis of best practices affect risk management decisions.
A5.5 Understand the role of contingency plans in risk management.
A6.0 Students understand the role and value of agricultural organizations:
A6.1 Understand the benefits of private, public, and governmental organizations, including the value and impact of cooperatives.

A6.2 Understand how participation within organizations would be beneficial in supporting various agricultural operations.
A6.3 Understand how to identify and electronically access public and private agricultural organizations.
A7.0 Students understand agricultural marketing systems:
A7.1 Understand how marketing functions in a free market society.
A7.2 Understand the advantages and disadvantages of the various marketing options for agricultural products and services.
A7.3 Understand how the law of comparative advantage affects agricultural production.
A7.4 Understand the impact of advertising and promotion on the marketing of agricultural products and services.
A7.5 Understand how promotion trends for agricultural products influence individuals.
A7.6 Understand how to develop a marketing plan for an agricultural product or service.
A8.0 Students understand the sales of agricultural products and services:
A8.1 Determine the most effective methods for assessing customer needs and wants.
A8.2 Understand the stages in making a successful sale and the various techniques used to approach potential customers and overcome their objections.
A8.3 Examine the physiological and psychological factors that influence motivation to purchase, including the fundamental steps in making a purchase.
A9.0 Students understand local, national, and international agricultural markets and how trade affects the economy:
A9.1 Understand how the importance of agricultural imports and exports affects state and national economies.
A9.2 Know how governmental, economic, and cultural factors affect international trade.
A9.3 Compare and contrast United States trade policies with those of other important trading partners.
A9.4 Understand how biotechnology affects trade and global economies.
A9.5 Understand how different cultural values affect agricultural production and marketing.
A9.6 Understand how negotiations and bargaining agreements affect trade agreements.
A9.7 Analyze agricultural marketing strategies in other parts of the world.

**B. Agricultural Mechanics Pathway**

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

B1.0 Students understand personal and group safety:
B1.1 Practice the rules for personal and group safety while working in an agricultural mechanics environment.

B1.2 Know the relationship between accepted shop management procedures and a safe working environment.
B1.3 Know how to safely secure loads on a variety of vehicles.
B2.0 Students understand the principles of basic woodworking:
B2.1 Know how to identify common wood products, lumber types, and sizes.
B2.2 Know how to calculate board feet, lumber volume, and square feet.
B2.3 Know how to identify, select, and implement basic fastening systems.
B2.4 Complete a woodworking project, including interpreting a plan, developing a bill of materials and cutting list, selecting materials, shaping, joining, and finishing.
B3.0 Students understand the basic electricity principles and wiring practices commonly used in agriculture:
B3.1 Understand the relationship between voltage, amperage, resistance, and power in single-phase alternating current (AC) circuits.
B3.2 Know how to use proper electrical test equipment for AC and direct current (DC).
B3.3 Analyze and correct basic circuit problems (e.g., open circuits, short circuits, incorrect grounding).
B3.4 Understand proper basic electrical circuit and wiring techniques with nonmetallic cable and conduit as defined by the National Electric Code.
B3.5 Interpret basic agricultural electrical plans.
B4.0 Students understand plumbing system practices commonly used in agriculture:
B4.1 Know basic plumbing fitting skills with a variety of materials, such as copper, PVC (polyvinyl chloride), steel, polyethylene, and ABS (acrylonitrile butadiene styrene).
B4.2 Understand the environmental influences on plumbing system choices (e.g., filter systems, water disposal).
B4.3 Know how various plumbing and irrigation systems are used in agriculture.
B4.4 Complete a plumbing project, including interpreting a plan, developing a bill of materials and cutting list, selecting materials, joining, and testing.
B5.0 Students understand agricultural cold metal processes:
B5.1 Know how to identify common metals, sizes, and shapes.
B5.2 Know basic tool-fitting skills.
B5.3 Know layout skills.
B5.4 Know basic cold metal processes (e.g., shearing, cutting, drilling, threading, bending.).
B5.5 Complete a cold metal project, including interpreting a plan, developing a bill of materials, selecting materials, shaping, fastening, and finishing.
B6.0 Students understand concrete and masonry practices commonly used in agriculture:
B6.1 Understand how to accurately calculate volume, materials needed, and project costs for a concrete or masonry project.
B6.2 Know proper bed preparation, concrete forms layout, and construction.
B6.3 Complete a concrete or masonry project, including developing a bill of materials, assembling, mixing, placing, and finishing.
B7.0 Students understand oxy-fuel cutting and welding:
B7.1 Understand the role of heat and oxidation in the cutting process.
B7.2 Know how to properly set up, adjust, shut down, and maintain an oxy-fuel

system.
B7.3 Know how to flame-cut metal with an oxy-fuel cutting torch.
B7.4 Know how to fusion-weld mild steel with and without filler rod by using oxy-fuel equipment.
B7.5 Know basic repair skills using a variety of techniques, such as brazing or hard surfacing.
B8.0 Students understand electric arc welding processes:
B8.1 Know how to select, properly adjust, safely employ, and maintain appropriate welding equipment (e.g., gas metal arc welding, shielded metal arc welding, gas tungsten arc welding).
B8.2 Apply gas metal arc welding, shielded metal arc welding, or flux core arc welding processes to fusion-weld mild steel with appropriate welding electrodes and related equipment.
B8.3 Weld a variety of joints in various positions.
B8.4 Know how to read welding symbols and plans, select electrodes, fit-up joints, and control heat and distortion.
B9.0 Students understand advanced metallurgy principles and fabrication techniques:
B9.1 Understand metallurgy principles, including distortion, hardening, tempering, and annealing.
B9.2 Operate and maintain various arc welding and cutting systems safely and appropriately.
B9.3 Operate and maintain fabrication tools and equipment safely and appropriately.
B9.4 Understand how to design project plans by using mechanical drawing techniques.
B9.5 Understand how to finish a metal project by implementing proper sequencing.
B9.6 Know how to manipulate and finish metal by using a variety of machines and techniques (e.g., lathe, mill, CNC plasma, shears, press break).
B9.7 Construct a welding project (using any electric welding process, appropriate products, joints, and positions), including interpreting a plan, developing a bill of materials, selecting materials, and developing a clear and concise fabrication contract.
B10.0 Students understand small and compact engines:
B10.1 Understand engine theory for both two- and four-stroke cycle engines.
B10.2 Know different types of small engines and their applications.
B10.3 Know small engine parts and explain the various systems (e.g., fuel, ignition, compression, cooling, lubrication systems).
B10.4 Know how to troubleshoot and solve problems with small engines.
B10.5 Know how to disassemble, inspect, adjust, and reassemble a small engine.
B10.6 Know how to look up parts, apply repair and maintenance recommendations from a repair manual, and complete appropriate forms, including work orders.
B11.0 Students understand the principles and applications of various engines and machinery used in agriculture:
B11.1 Understand how to identify common agricultural machinery.
B11.2 Operate and maintain equipment safely and efficiently.
B11.3 Know the various types of engines found on agricultural machinery and under stand the theory and safe operation of their systems (e.g., cooling, electrical, fuel).
B11.4 Know the theory and operation of mobile hydraulic systems and power take-off systems.

B11.5 Troubleshoot common problems with engines and agricultural equipment.
B11.6 Understand the theory and operation of 12-volt DC electronic and electrical systems (e.g., circuit design, starting, charging, and safety circuits).
B12.0 Students understand land measurement and construction techniques commonly used in agriculture:
B12.1 Understand common surveying techniques used in agriculture (e.g., leveling, land measurement, building layout).
B12.2 Know how to draw and interpret architectural plans.
B12.3 Know how to install single- and three-phase wiring and control systems found in agricultural structures, pumps, and irrigation systems.
B12.4 Install plumbing in agricultural structures (e.g., potable water, sewer, irrigation).
B12.5 Form, place, and finish concrete or masonry (e.g., concrete block).
B12.6 Understand how to construct agricultural structures by using wood framing and steel framing systems (e.g., barns, shops, greenhouses, animal structures).
B12.7 Develop clear and concise agricultural construction contracts.

**C. Agriscience Pathway**

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

C1.0 Students understand the role of agriculture in the California economy:
C1.1 Understand the history of the agricultural industry in California.
C1.2 Understand how California agriculture affects the quality of life.
C1.3 Understand the interrelationship of California agriculture and society at the local, state, national, and international levels.
C1.4 Understand the economic impact of leading California agricultural commodities.
C1.5 Understand the economic impact of major natural resources in California.
C1.6 Know the economic importance of major agricultural exports and imports.
C2.0 Students understand the interrelationship between agriculture and the environment:
C2.1 Understand important agricultural environmental impacts on soil, water, and air.
C2.2 Understand current agricultural environmental challenges.
C2.3 Understand how natural resources are used in agriculture.
C2.4 Compare and contrast practices for conserving renewable and nonrenewable resources.
C2.5 Understand how new energy sources are developed from agricultural products (e.g., gas-cogeneration and ethanol).
C3.0 Students understand the effects of technology on agriculture:
C3.1 Understand how an agricultural commodity moves from producer to consumer.
C3.2 Understand how technology influences factors such as labor, efficiency, diversity, availability, mechanization, communication, and so forth.
C3.3 Understand public concern for technological advancements in agriculture, such

as genetically modified organisms.
C3.4 Understand the laws and regulations concerning biotechnology.
C4.0 Students understand the importance of animals, the domestication of animals, and the role of animals in modern society:
C4.1 Understand the evolution and roles of domesticated animals in society.
C4.2 Know the differences between domestication and natural selection.
C4.3 Understand the modern-day uses of animals and animal by-products.
C4.4 Understand various points of view regarding the use of animals.
C4.5 Understand unique and alternative uses of animals (e.g., Handi-Riders and companion animals).
C5.0 Students understand the cell structure and function of plants and animals:
C5.1 Understand the purpose and anatomy of cells.
C5.2 Know how cell parts function.
C5.3 Understand various cell actions, such as osmosis and cell division.
C5.4 Understand how plant and animal cells are alike and different.
C6.0 Students understand animal anatomy and systems:
C6.1 Know the names and locations of the external anatomy of animals.
C6.2 Know the anatomy and major functions of vertebrate systems, including digestive, reproductive, circulatory, nervous, muscular, skeletal, respiratory, and endocrine systems.
C7.0 Students understand basic animal genetics:
C7.1 Differentiate between genotype and phenotype, and describe how dominant and recessive genes function.
C7.2 Compare genetic characteristics among cattle, sheep, swine, and horse breeds.
C7.3 Understand how to display phenotype and genotype ratios (e.g., by using a Punnett Square).
C7.4 Understand the fertilization process.
C7.5 Understand the purpose and processes of mitosis and meiosis.
C8.0 Students understand fundamental animal nutrition and feeding:
C8.1 Know types of nutrients required by farm animals (e.g., proteins, minerals, vitamins, carbohydrates, fats/oils, water).
C8.2 Analyze suitable common feed ingredients, including forages, roughages, concentrates, and supplements, for ruminant, monogastric, equine, and avian digestive systems.
C8.3 Understand basic animal feeding guidelines and evaluate sample feeding programs for various species, including space requirements and economic considerations.
C9.0 Students understand basic animal health:
C9.1 Assess the appearance and behavior of a normal, healthy animal.
C9.2 Understand the ways in which housing, sanitation, and nutrition influence animal health and behavior.
C9.3 Understand the causes and control of common animal diseases.
C9.4 Understand how to control parasites and why.
C9.5 Understand the legal requirements for the procurement, storage, methods of application, and withdrawal times of animal medications and know proper equipment handling and disposal techniques.

C10.0 Students understand soil science principles:
C10.1 Recognize the major soil components and types.
C10.2 Understand how soil texture, structure, pH, and salinity affect plant growth.
C10.3 Understand water delivery and irrigation system options.
C10.4 Understand the types, uses, and applications of amendments and fertilizers.
C11.0 Students understand plant growth and development:
C11.1 Understand the anatomy and functions of plant systems and structures.
C11.2 Understand plant growth requirements.
C11.3 Know annual, biennial, and perennial life cycles.
C11.4 Examine plant sexual and asexual reproduction.
C11.5 Understand the photosynthesis process and the roles of the sun, chlorophyll, sugar, oxygen, carbon dioxide, and water in the process.
C11.6 Understand the respiration process in the breakdown of food and organic matter.
C12.0 Students understand fundamental pest management:
C12.1 Understand the major classifications of pests (e.g., insects, weeds, disease, vertebrate pests).
C12.2 Understand chemical, mechanical, cultural, and biological methods of plant pest control.
C12.3 Understand the major principles, advantages, and disadvantages of integrated pest management.
C13.0 Students understand the scientific method:
C13.1 Understand the steps of the scientific method.
C13.2 Analyze an animal or plant problem and devise a solution based on the scientific method.
C13.3 Use the scientific method to conduct agricultural experiments.

**D. Animal Science Pathway**

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

D1.0 Students understand the necessary elements for proper animal housing and animal-handling equipment:
D1.1 Understand appropriate space and location requirements for habitat, housing, feed, and water.
D1.2 Understand how to select habitat and housing conditions and materials (such as indoor and outdoor housing, fencing materials, air flow/ventilation, and shelters) to meet the needs of various animal species.
D1.3 Understand the purpose and the safe and humane use of restraint equipment, such as squeeze chutes, halters, and twitches.
D1.4 Understand the purpose and the safe and humane use of animal husbandry tools, such as hoof trimmers, electric shears, elastrators, dehorning tools, and

scales.
D2.0 Students understand key principles of animal nutrition:
D2.1 Understand the flow of nutrients from the soil, through the animal, and back to the soil.
D2.2 Understand the principles for providing proper balanced rations for a variety of production stages in ruminants and monogastrics.
D2.3 Understand the digestive processes of the ruminant, monogastric, avian, and equine digestive systems.
D2.4 Understand how animal nutrition is affected by the digestive, endocrine, and circulatory systems.
D3.0 Students understand animal physiology:
D3.1 Understand the major physiological systems and the function of the organs within each system.
D3.2 Understand the animal management practices that are likely to improve the functioning of the various physiological systems.
D4.0 Students understand animal reproduction, including the function of reproductive organs:
D4.1 Understand animal conception (including estrus cycles, ovulation, and insemination).
D4.2 Understand the gestation process and basic fetal development.
D4.3 Understand the parturition process, including the identification of potential problems and their solutions.
D4.4 Understand the role of artificial insemination and embryo transfer in animal agriculture.
D4.5 Understand commonly used animal production breeding systems (e.g., purebred compared with crossbred) and reasons for their use.
D5.0 Students understand animal inheritance and selection principles, including the structure and role of DNA:
D5.1 Evaluate a group of animals for desired qualities and discern among them for breeding selection.
D5.2 Understand how to use animal performance data in the selection and management of production animals.
D5.3 Research and discuss current technology used to measure desirable traits.
D5.4 Understand how to predict phenotypic and genotypic results of a dominant and recessive gene pair.
D5.5 Understand the role of mutations (both naturally occurring and artificially induced) and hybrids in animal genetics.
D6.0 Students understand the causes and effects of diseases and illnesses in animals:
D6.1 Understand the signs of normal health in contrast to illness and disease.
D6.2 Understand the importance of animal behavior in diagnosing animal sickness and disease.
D6.3 Understand the common pathogens, vectors, and hosts that cause disease in animals.
D6.4 Understand prevention, control, and treatment practices related to pests and parasites.
D6.5 Apply quality assurance practices to the proper administration of medicines and animal handling.
D6.6 Understand how diseases are passed among animal species and from animals to

humans and how that relationship affects health and food safety.
D6.7 Understand the impacts on local, national, and global economies as well as on consumers and producers when animal diseases are not appropriately contained and eradicated.
D7.0 Students understand common rangeland management practices and their impact on a balanced ecosystem:
D7.1 Understand the role of rangeland use in an effective animal production program.
D7.2 Know how rangeland management practices affect pasture production, erosion control, and the general balance of the ecosystem.
D7.3 Understand how to manage rangelands (including how to calculate carrying capacity) for a variety of animal species and locations.
D7.4 Understand how to balance rangeland use for animal grazing and for wildlife habitat.
D8.0 Students understand the challenges associated with animal waste management:
D8.1 Understand animal waste treatment and disposal management systems.
D8.2 Understand various methods for using animal waste and their environmental impacts.
D8.3 Understand the health and safety regulations that are an integral part of properly managed animal waste systems.
D9.0 Students understand animal welfare concerns and management practices that support animal welfare:
D9.1 Know the early warning signs of animal distress and how to rectify the problem.
D9.2 Understand public concerns for animal welfare in the context of housing, behavior, nutrition, transportation, disposal, and harvest of animals.
D9.3 Understand federal and state animal welfare laws and regulations, such as those dealing with abandoned and neglected animals, animal fighting, euthanasia, and medical research.
D9.4 Understand the regulations for humane transport and harvest of animals, such as those delineated by the U.S. Department of Agriculture, Food Safety and Inspection Service, and the Humane Methods of Slaughter Act.
D10.0 Students understand the production of large animals (e.g., cattle, horses, swine, sheep, goats) and small animals (e.g., poultry, cavy, rabbits):
D10.1 Know how to synthesize and implement optimum requirements for diet, genetics, habitat, and behavior in the production of large and small animals.
D10.2 Understand how to develop, maintain, and use growth and management records for large or small animals.
D11.0 Students understand the production of specialty animals (e.g., fish, marine animals, llamas, tall flightless birds):
D11.1 Understand the specialty animal’s role in agriculture (e.g., fish farms, pack animals, working dogs).
D11.2 Understand the unique nutrition, health, and habitat requirements for specialty animals.
D11.3 Know how to synthesize and implement optimum requirements for diet, genetics, habitat, and behavior in the production of specialty animals.
D11.4 Understand how to develop, maintain, and use growth and management records for specialty animals.

D12.0 Students understand how animal products and by-products are processed and marketed:
D12.1 Understand animal harvest, carcass inspection and grading, and meat processing safety regulations and practices and the removal and disposal of nonedible by-products, such as those outlined in Hazard Analysis and Critical Control Point documents.
D12.2 Understand the relative importance of the major meat classifications, including the per capita consumption and nutritive value of those classifications.
D12.3 Understand how meat-based products and meals are made.
D12.4 Understand how nonmeat products (such as eggs, wool, pelts, hides, and by-products) are harvested and processed.
D12.5 Understand how meat products and nonmeat products are marketed.
D12.6 Understand the value of animal by-products to nonagricultural industries.

**E. Forestry and Natural Resources Pathway**

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

E1.0 Students understand the importance of energy and energy cycles:
E1.1 Understand the oxygen, carbon, nitrogen, and water cycles.
E1.2 Understand the difference between renewable and nonrenewable energy sources.
E1.3 Understand the difference between natural resource management conservation strategies and preservation strategies.
E1.4 Compare the effects on air and water quality of using different forms of energy.
E1.5 Analyze the way in which human activities influence energy cycles and natural resource management.
E2.0 Students understand air and water use, management practices, and conservation strategies:
E2.1 Understand the government's role in regulating air, soil, and water use management practices and conservation strategies.
E2.2 Understand air and water conservation issues.
E2.3 Understand appropriate water conservation measures.
E2.4 Understand the component of a plan that monitors water quality.
E2.5 Understand the component of a plan that monitors air quality.
E2.6 Analyze the way in which water management affects the environment and human needs.
E3.0 Students understand soil composition and soil management:
E3.1 Understand the systems used to classify soils.
E3.2 Understand the reasons for and importance of soil conservation.
E3.3 Understand how to analyze soils found in the different natural resource management areas.
E3.4 Understand how to develop and implement a soil management plan for a natural resource management area.
E3.5 Understand how to analyze existing soil surveys to develop effective management

plans.
E4.0 Students understand rangeland management:
E4.1 Know the locations of major U.S. and California rangeland areas.
E4.2 Understand the interrelationship of rangeland management, the environment, wildlife management, and the livestock industry.
E4.3 Understand practices used to improve rangeland quality.
E4.4 Analyze the carrying capacity in various rangelands for both wildlife species and domestic livestock.
E4.5 Distinguish among different browse and forage species in California rangelands.
E4.6 Understand the components of a rangeland monitoring plan.
E4.7 Understand the requirements and rights accompanying public land grazing permits and the government agencies involved (e.g., Bureau of Land Management and U.S. Forest Service).
E5.0 Students understand wildlife management and habitat:
E5.1 Understand the relationship between habitat and wildlife population.
E5.2 Understand habitat requirements for different species and identify factors that influence population dynamics.
E5.3 Understand the methods for determining existing wildlife species populations.
E5.4 Understand mammalian and avian reproductive processes and explain how nutrition and habitat affect reproduction and population.
E5.5 Understand a variety of management practices used to manage wildlife populations for hunting and other recreational purposes.
E5.6 Analyze the economic and environmental significance of sport hunting and fishing industries.
E5.7 Understand the purpose, history, terminology, and challenges of the Endangered Species Act and current activities related to the Act.
E6.0 Students understand aquatic resource use and management:
E6.1 Understand the different types of aquatic resources.
E6.2 Know the major body parts, digestive systems, and reproductive organs of aquatic species.
E6.3 Understand a variety of methods to determine the populations of existing aquatic species.
E6.4 Analyze the relationship between water quality and aquatic species habitat.
E6.5 Understand a variety of management practices for managing aquatic species for sport fishing and other purposes.
E6.6 Understand how to make financial and production decisions and maintain growth and management records for a selected aquatic species.
E7.0 Students understand the outdoor recreation industry:
E7.1 Understand the potential environmental impacts of recreational activities and how to manage the resources affected.
E7.2 Understand basic survival skills and first-aid procedures.
E7.3 Understand appropriate trail construction and maintenance techniques.
E7.4 Understand how to select appropriate recreational gear for trips of varying types and durations and how to use it safely and appropriately (for minimum environmental impact).
E7.5 Know how to set up a campsite for minimum environmental impact.

E8.0 Students understand basic plant physiology, anatomy, and taxonomy:
E8.1 Understand the scientific method of animal classification, including order, family, genus, and species.
E8.2 Know how to use a dichotomous key to identify plants and animals.
E8.3 Know how to identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
E8.4 Recognize the factors that influence plant growth, such as respiration, temperature, nutrients, and photosynthesis.
E9.0 Students understand the role of fire in natural resource management:
E9.1 Understand the role of fire in forest and rangeland ecosystems.
E9.2 Understand the significance of each of the components of the “fire triangle.”
E9.3 Know appropriate wildland fire-suppression practices.
E9.4 Understand the components of a fire-control plan.
E9.5 Know how to use fire-control tools safely.
E9.6 Know the training requirements for fire-suppression certification.
E10.0 Students understand forest management practices:
E10.1 Understand how social, political, and economic factors can affect the use of forests.
E10.2 Understand the California Forest Practice Act and the requirements for Timber Harvest and Habitat Conservation Plans.
E10.3 Analyze forest management systems (e.g., sustained yield, watershed management, ecosystem management, multiple-use management).
E10.4 Analyze harvest and renewability (e.g., re-seeding and thinning) systems and identify the impact of each on the land.
E10.5 Understand Silvicultural systems and skills, including appropriate tool use.
E10.6 Understand how to identify and diagnose damage from destructive insects, diseases, and weather, and know methods for their management.
E11.0 Students understand the basic concepts of measurement, surveying, and mapping:
E11.1 Understand the Public Land Survey System.
E11.2 Use surveying equipment, including global positioning satellites, maps, and a compass to determine area, boundaries, and elevation differences.
E11.3 Know how to apply timber-cruising and log-scaling skills to determine timber and log volume for management and marketing.
E11.4 Understand how to create a management plan map that includes layer information and data points from global information systems.
E12.0 Students understand the use, processing, and marketing of products from natural resource industries:
E12.1 Know the marketing processes and manufacturing standards for a variety of natural resource products, including mining, quarrying, and drilling.
E12.2 Know how to manufacture a product (to manufacturing standards) from a natural resource.
E12.3 Analyze the production of specialty and seasonal products from natural resources.
E12.4 Know different wood types and their uses.
E12.5 Know lumber manufacturing processes.
E13.0 Students understand public and private land issues:
E13.1 Understand the differences between publicly and privately held lands.

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

**F. Ornamental Horticulture Pathway**

The Ornamental Horticulture Pathway prepares students for careers in the nursery, landscaping, and floral industries. Topics include plant identification, plant physiology, soil science, plant reproduction, nursery production, and floriculture as well as landscaping design, installation, and maintenance.
F1.0 Students understand plant classification and use principles:
F1.1 Understand how to classify and identify plants by order, family, genus, and species.
F1.2 Understand how to identify plants by using a dichotomous key.
F1.3 Understand how common plant parts are used to classify the plants.
F1.4 Understand how to classify and identify plants by using botanical growth habits, landscape uses, and cultural requirements.
F1.5 Understand plant selection and identification for local landscape applications.
F2.0 Students understand plant physiology and growth principles:
F2.1 Understand plant systems, nutrient transportation, structure, and energy storage.
F2.2 Understand the seed's essential parts and functions.
F2.3 Understand how primary, secondary, and trace elements are used in plant growth.
F2.4 Understand the factors that influence plant growth, including water, nutrients, light, soil, air, and climate.
F2.5 Understand the tissues seen in a cross section of woody and herbaceous plants.
F2.6 Understand the factors that affect plant growth.
F3.0 Students understand sexual and asexual plant reproduction:
F3.1 Understand the different forms of sexual and asexual plant reproduction.
F3.2 Understand the various techniques for successful plant propagation (e.g., budding, grafting, cuttings, seeds).
F3.3 Understand how to monitor plant reproduction for the development of a saleable product.
F4.0 Students understand basic integrated pest management principles:
F4.1 Read and interpret pesticide labels and understand safe pesticide management practices.
F4.2 Understand how pesticide regulations and government agencies affect agriculture.
F4.3 Understand common horticultural pests and diseases and methods of controlling them.
F4.4 Understand the systematic approach to solving plant problems.
F5.0 Students understand water and soil (media) management practices:
F5.1 Understand how basic soil science and water principles affect plant growth.
F5.2 Know basic irrigation design and installation methods.

F5.3 Prepare and amend soils, implement soil conservation methods, and compare results.
F5.4 Understand major issues related to water sources and water quality.
F5.5 Know the components of soilless media and the use of those media in various types of containers.
F6.0 Students understand ornamental plant nutrition practices:
F6.1 Analyze how primary and secondary nutrients and trace elements affect ornamental plants.
F6.2 Understand basic nutrient testing procedures on soil and plant tissue.
F6.3 Analyze organic and inorganic fertilizers to understand their appropriate uses.
F6.4 Understand how to read and interpret labels to properly apply fertilizers.
F7.0 Students understand the selection, installation, and maintenance of turf:
F7.1 Understand the selection and management of landscape and sports field turf.
F7.2 Understand how to select, install, and maintain a designated turfgrass area.
F7.3 Understand how the use of turf benefits the environment.
F8.0 Students understand nursery production principles:
F8.1 Understand how to properly use production facilities and common nursery equipment.
F8.2 Understand common nursery production practices.
F8.3 Understand how to propagate and maintain a horticultural crop to the point of sale.
F8.4 Understand marketing and merchandising principles used in nursery production.
F9.0 Students understand the use of containers and horticultural tools, equipment, and facilities:
F9.1 Understand the use of different types of containers and demonstrate how to maintain growing containers in controlled environments.
F9.2 Operate and maintain selected hand and power equipment safely and appropriately.
F9.3 Select proper tools for specific horticultural jobs.
F9.4 Understand how to install landscape components and electrical land and water features.
F10.0 Students understand basic landscape planning, design, construction, and maintenance:
F10.1 Know the terms associated with landscape and design and their appropriate use.
F10.2 Understand the principles of residential design, including how to render design to scale.
F10.3 Understand proper landscape planting and maintenance practices.
F10.4 Prune ornamental shrubs, trees, and fruit trees.
F10.5 Develop clear and concise landscape business contracts.
F11.0 Students understand basic floral design principles:
F11.1 Understand the use of plant materials and tools.
F11.2 Apply basic design principles to products and designs.
F11.3 Handle, prepare, and arrange cut flowers appropriately.
F11.4 Understand marketing and merchandising principles used in the floral industry.

**G. Plant and Soil Science Pathway**

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

G1.0 Students understand plant classification principles:

G1.1 Understand how to classify and identify plants by order, family, genus, and species.

G1.2 Understand how to identify plants by using a dichotomous key.

G1.3 Understand how common plant parts are used to classify the plants.

G1.4 Understand the differences between and uses of native and nonnative plants.

G1.5 Understand the differences between monocots and dicots.

G1.6 Understand the differences between plants under production and weeds.

G2.0 Students understand cell biology:

G2.1 Understand the differences between prokaryotic cells and plant and animal eukaryotic cells and how viruses differ from them in complexity and general structure.

G2.2 Understand plant cellular function reactions when plants are grown under different conditions.

G2.3 Understand what functions organelles play in the health of the cell.

G2.4 Understand the part of the cell that is responsible for the genetic information that controls plant growth and development.

G2.5 Understand plant inheritance principles, including the structure and role of DNA.

G2.6 Understand which organelles in plant cells carry out photosynthesis.

G3.0 Students understand plant physiology and growth principles:

G3.1 Understand plant systems, nutrient transportation, structure, and energy storage.

G3.2 Understand the seed's essential parts and functions.

G3.3 Understand how primary, secondary, and trace elements are used in plant growth.

G3.4 Understand the factors that influence plant growth, including water, nutrients, light, soil, air, and climate.

G3.5 Understand the tissues seen in a cross section of woody and herbaceous plants.

G3.6 Understand the factors that affect plant growth and predict plant response.

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

G4.1 Understand the different forms of sexual and asexual plant reproduction.

G4.2 Understand the various techniques for successful plant propagation (e.g., budding, grafting, cuttings, and seeds).

G4.3 Understand the proper sterile technique used in tissue culture.

G5.0 Students understand pest problems and management:

G5.1 Understand how to categorize insects as pests, beneficial, or neutral and their roles.

G5.2 Understand the role of other pests, such as nematodes, molds, mildews, and weeds.

G5.3 Know conventional, sustainable, and organic management methods to prevent or treat plant disease symptoms.

G5.4 Understand integrated pest management to prevent, treat, and control plant disease symptoms (including conventional, sustainable, and organic management

methods).
G5.5 Understand how biotechnology can be used to manage pests.
G6.0 Students understand soils and plant production:
G6.1 Understand soil types, soil texture, structure, and bulk density and explain the U.S. Department of Agriculture (USDA) soil-quality rating procedure.
G6.2 Understand soil properties necessary for successful plant production, including pH, EC, and essential nutrients.
G6.3 Understand soil biology and diagram the soil food chain.
G6.4 Understand how soil biology affects the environment and natural resources.
G7.0 Students understand effective tillage and soil conservation management practices:
G7.1 Understand how to effectively manage and conserve soil through conventional, minimum, conservation, and no-tillage irrigation and through drainage and tillage practices.
G7.2 Understand how global positioning systems, surveying, laser leveling, and other tillage practices conserve soil.
G7.3 Use tools such as the USDA and the local Resource Conservation District soil survey maps to determine appropriate soil management practices.
G8.0 Students understand effective water management practices:
G8.1 Understand California water history, current issues, water rights, water law, and water transfer through different distribution projects throughout the state.
G8.2 Understand the local, state, and federal agencies that regulate water quality and availability in California.
G8.3 Understand the definition of a watershed and how it is used to measure water quality.
G8.4 Understand effective water management and conservation practices, including the use of tailwater ponds.
G8.5 Know water-testing standards and perform bioassay and macro-invertebrate protocols to assess water quality.
G9.0 Students understand the concept of an "agrosystem" approach to production:
G9.1 Understand how to identify and classify the plants and animals in an agricultural system (as producers, consumers, or decomposers).
G9.2 Understand the elements of conventional, sustainable, and organic production systems.
G9.3 Understand the components of "whole-system management."
G10.0 Students understand local crop management and production practices:
G10.1 Understand local cultural techniques, including monitoring, pruning, fertilization, planting, irrigation, harvest treatments, processing, and packaging practices for various tree, grain, hay, and vegetable classes.
G10.2 Understand common marketing and shipping characteristics of local commodities.
G10.3 Understand general maturity and harvest-time guidelines for specific local plant products.
G11.0 Students understand plant biotechnology:
G11.1 Understand how changing technology—such as micropropagation, biological pest controls, and genetic engineering (including DNA extraction and gel electrophoresis)—affects plant production, yields, and management.
G11.2 Understand the various technology advancements that affect plant and soil

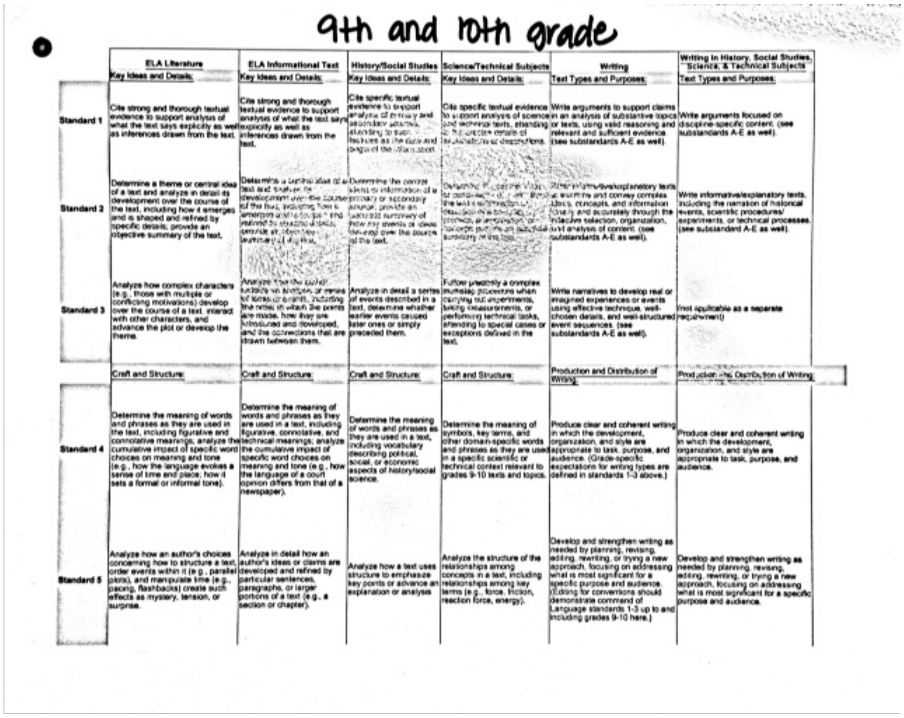
science (such as global positioning systems, global information systems, variable rate technology, and remote sensing).

G11.3 Know how herbicide-resistant plant genes can affect the environment.

G11.4 Understand how genetic engineering techniques have been used to improve crop yields.

G11.5 Understand the effects of agricultural biotechnology, including genetically modified organisms, on the agriculture industry and the larger society and the pros and cons of such use.

**Every teacher had their own copy of the Literacy Standards and ELD Standards**



9th and 10th grade

| | ELA Literature | ELA Informational Text | History/Social Studies | Science/Technical Subjects | Writing | Writing in History, Social Studies, Science, & Technical Subjects |
|---|---|---|---|---|---|---|
| | Key Ideas and Details: | Key Ideas and Details: | Key Ideas and Details: | Key Ideas and Details: | Text Types and Purposes: | Text Types and Purposes: |
| Standard 1 | Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. | Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. | Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information. | Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. | Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. (see substandards A-E as well) | Write arguments focused on discipline-specific content. (see substandards A-E as well). |
| Standard 2 | Determine a theme or central idea of a text and analyze in detail 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. | 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. | Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text. | Determine the central ideas or conclusions of a text; [illegible] | 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. (see substandards A-E as well). | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (see substandard A-E as well). |
| Standard 3 | Analyze how complex characters (e.g., those with multiple or conflicting motivations) develop over the course of a text, interact with other characters, and advance the plot or develop the theme. | 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. | Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them. | 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. | Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. (see substandards A-E as well). | (not applicable as a separate requirement) |
| | Craft and Structure: | Craft and Structure: | Craft and Structure: | Craft and Structure: | Production and Distribution of Writing: | Production and Distribution of Writing: |
| Standard 4 | Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone). | 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). | Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social science. | 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. | 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.) | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| Standard 5 | Analyze how an author's choices concerning how to structure a text, order events within it (e.g., parallel plots), and manipulate time (e.g., pacing, flashbacks) create such effects as mystery, tension, or surprise. | Analyze in detail how an author's ideas or claims are developed and refined by particular sentences, paragraphs, or larger portions of a text (e.g., a section or chapter). | Analyze how a text uses structure to emphasize key points or advance an explanation or analysis. | Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). | 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 9-10 here.) | 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. |

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|---|---|---|---|---|---|---|
| | Craft and Structure: | Craft and Structure: | Craft and Structure: | Craft and Structure: | Production and Distribution of Writing: | Production and Distribution of Writing: |
| Standard 6 | Analyze a particular point of view or cultural experience reflected in a work of literature from outside the United States, drawing on a wide reading of world literature. | Determine an author's point of view or purpose in a text and analyze how an author uses rhetoric to advance that point of view or purpose. | Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts. | 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. | 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. | 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. |
| | Integration of Knowledge and Idea | Integration of Knowledge an | Integration of Knowledge | Integration of Knowledge and | Research to Build and Present Knowledge: | Research to Build and Present Knowledge: |
| Standard 7 | Analyze the representation of a subject or a key scene in two different artistic mediums, including what is emphasized or absent in each treatment (e.g., Auden's "Musée des Beaux Arts" and Breughel's Landscape with the Fall of Icarus). | 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. | Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text. | 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. | 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. | 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. |
| Standard 8 | (RL 9-10.8 not applicable to literature) | 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. | Assess the extent to which the reasoning and evidence in a text support the author's claims. | 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. | 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. | 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. |
| Standard 9 | Analyze how an author draws on and transforms source material in a specific work (e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare). | Analyze seminal U.S. documents of historical and literary significance (e.g., Washington's Farewell Address, the Gettysburg Address, Roosevelt's Four Freedoms speech, King's "Letter from Birmingham Jail"), including how they address related themes and concepts. | Compare and contrast treatments of the same topic in several primary and secondary sources. | 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. | Draw evidence from literary or informational texts to support analysis, reflection, and research. (See substandards A & B as well). | Draw evidence from informational texts to support analysis, reflection, and research. |
| | Range of Reading & Level of Text Complexity | Range of Reading & Level of Text Complexity | Range of Reading & Level of Text Complexity | Range of Reading & Level of Text Complexity | Range of Writing: | Range of Writing: |
| Standard 10 | By the end of grade 9, read and comprehend literature, including stories, dramas, and poems, 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 literature, including stories, dramas, and poems, at the high end of the grades 9-10 text complexity band independently and proficiently. | 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. | By the end of grade 10, read and comprehend history/social studies texts in the grades 9-10 text complexity band independently and proficiently. | By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently. | 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. | 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. |

# 11th and 12th grade

| | ELA Literature | ELA Informational Text | History/Social Studies | Science/Technical Subject | Writing | Writing in History, Social Studies, Science, & Technical Subjects |
|---|---|---|---|---|---|---|
| | Key Ideas and Details: | Key Ideas and [illegible] | [illegible] Details: | Key Ideas and Details: | Text Types and Purposes: | Text Types and Purposes. |
| Standard 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. | 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. | Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole. | 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. | Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. (see substandards A-E as well) | Write arguments focused on discipline-specific content. (see substandards A-E as well) |
| Standard 2 | Determine two or more themes or 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 produce a complex account; provide an objective summary of the text. | 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. | Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas. | 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. | 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. (See substandards A-E as well) | Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. (see substandards A-E as well) |
| Standard 3 | Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters are introduced and developed). | 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. | Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain. | 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. | Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. (See substandard A-E as well) | (See note; not applicable as a separate requirement) |
| | Craft and Structure: | Craft and Structure: | [illegible] Structure: | Craft and Structure: | Production and Distribution of Writing | Production and Distribution of Writing |
| Standard 4 | Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (Include Shakespeare as well as other authors.) | 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). | Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines faction in Federalist No. 10). | 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. | 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.) | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| Standard 5 | Analyze how an author's choices concerning how to structure specific parts of a text (e.g., the choice of where to begin or end a story, the choice to provide a comedic or tragic resolution) contribute to its overall structure and meaning as well as its aesthetic impact. | Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging. | Analyze in detail how a complex primary source is structured, including how key sentences, paragraphs, and larger portions of the text contribute to the whole. | Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. | 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 here.) | 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. |

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| | Craft and Structure: | Craft and Structure: | [illegible] Structure: | Craft and Structure: | Production and Distribution of Writing | Production and Distribution of Writing |
| Standard 6 | Analyze a case in which grasping a point of view requires distinguishing what is directly stated in a text from what is really meant (e.g., satire, sarcasm, irony, or understatement). | Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness or beauty of the text. | Evaluate authors' differing points of view on the same historical event or issue by assessing the authors' claims, reasoning, and evidence. | 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. | 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. | 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. |
| | Integration of Knowledge and Ideas | [illegible] | [illegible] of Knowledge and Ideas | Integration of Knowledge and Ideas | Research to Build and Present Knowledge | Research to Build and Present Knowledge |
| Standard 7 | Analyze multiple interpretations of a story, drama, or poem (e.g., recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.) | 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. | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem. | 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. | 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. | 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. |
| Standard 8 | (RL.11-12.8 not applicable to literature) | 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). | Evaluate an author's premises, claims, and evidence by corroborating or challenging them with other information. | 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. | 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 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. | 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. |
| Standard 9 | Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics. | Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including The Declaration of Independence, the Preamble to the Constitution, the Bill of Rights, and Lincoln's Second Inaugural Address) for their themes, purposes, and rhetorical features. | Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources. | 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. | Draw evidence from literary or informational texts to support analysis, reflection, and research. (See substandard A & B as well) | Draw evidence from informational texts to support analysis, reflection, and research. |
| | Range of Reading & Level of Text Complexity | Range of Reading & Level of Text Complexity | Range of Reading & Level of Text Complexity | Range of Reading & Level of Text Complexity | Range of Writing | Range of Writing |
| Standard 10 | By the end of grade 11, read and comprehend literature, including stories, dramas, and poems, 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 literature, including stories, dramas, and poems, at the high end of the grades 11-CCR text complexity band independently and proficiently. | 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. | By the end of grade 12, read and comprehend history/social studies texts in the grades 11-CCR text complexity band independently and proficiently. | By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently. | 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. | 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. |

# ELD STANDARDS GRADES 9-10

**Part I: Interacting in Meaningful Ways**

| | | Emerging | Expanding | Bridging |
|---|---|---|---|---|
| Collaborative | ***Exchanging information/ ideas*** | Engage in conversational exchanges and express ideas on familiar current events and academic topics by asking and answering yes-no questions and wh-questions and responding using phrases and short sentences. | Contribute to class, group, and partner discussions, sustaining conversations on a variety of age and grade-appropriate academic topics by following turn-taking rules, asking and answering relevant, on-topic questions, affirming others, providing additional, relevant information, and paraphrasing key ideas. | Contribute to class, group, and partner discussions, sustaining conversations on a variety of age and grade-appropriate academic topics by following turn-taking rules, asking and answering relevant, on-topic questions, affirming others, and providing coherent and well-articulated comments and additional information. |
| Collaborative | ***Interacting via written English*** | English: Collaborate with peers to engage in short, grade-appropriate written exchanges and writing projects, using technology as appropriate. | Collaborate with peers to engage in increasingly complex grade-appropriate written exchanges and writing projects, using technology as appropriate. | Collaborate with peers to engage in a variety of extended written exchanges and complex grade-appropriate writing projects, using technology as appropriate. |
| Collaborative | ***Supporting opinions and persuading others*** | Negotiate with or persuade others in conversations using learned phrases (e.g., Would you say that again? I think ...), as well as open responses to express and defend opinions. | Negotiate with or persuade others in conversations (e.g., to provide counterarguments) using a growing number of learned phrases (I see your point, but ...) and open responses to express and defend nuanced opinions. | Negotiate with or persuade others in conversations in appropriate registers (e.g., to acknowledge new information in an academic conversation but then politely offer a counterpoint) using a variety of learned phrases, indirect reported speech (e.g., I heard you say X, and I haven't thought about that before. However ...), and open responses to express and defend nuanced opinions. |
| Collaborative | ***Adapting language choices*** | Adjust language choices according to the context (e.g., classroom, community) and audience (e.g., peers, teachers). | Adjust language choices according to the context (e.g., classroom, community), purpose (e.g., to persuade, to provide arguments or counterarguments), task, and audience (e.g., peers, teachers, guest lecturer). | Adjust language choices according to the task (e.g., group presentation of research project), context (e.g., classroom, community), purpose (e.g., to persuade, to provide arguments or counterarguments), and audience (e.g., peers, teachers, college recruiter). |
| Interpretive | ***Listening Actively*** | Demonstrate comprehension of oral presentations and discussions on familiar social and academic topics by asking and answering questions, with prompting and substantial support. | Demonstrate comprehension of oral presentations and discussions on a variety of social and academic topics by asking and answering questions that show thoughtful consideration of the ideas or arguments, with moderate support. | Demonstrate comprehension of oral presentations and discussions on a variety of social and academic topics by asking and answering relevant and complex questions that show thoughtful consideration of the ideas or arguments, with light support. |
| Interpretive | ***Reading/Viewing Closely*** | A. Explain ideas, phenomena, processes, and text relationships (e.g., compare/contrast, cause/effect, evidence-based argument) based on close reading of a variety of grade-appropriate texts, presented in various print and multimedia formats, using short sentences and a select set of general academic and domain-specific words. B. Explain inferences and conclusions drawn from close reading of gradeappropriate texts and viewing of multimedia using familiar verbs (e.g., seems that). C. Use knowledge of morphology (e.g., common prefixes and suffixes), context, reference materials, and visual cues to determine the meaning of unknown and multiple-meaning words on familiar topics. | a. Explain ideas, phenomena, processes, and relationships within and across texts (e.g., compare/contrast, cause/effect, themes, evidence-based argument) based on close reading of a variety of gradeappropriate texts, presented in various print and multimedia formats, using increasingly detailed sentences, and an increasing variety of general academic and domain-specific words. b. Explain inferences and conclusions drawn from close reading of grade-appropriate texts and viewing of multimedia using an increasing variety of verbs and adverbials (e.g., indicates that, suggests, as a result). c. Use knowledge of morphology (e.g., affixes, Greek and Latin roots), context, reference materials, and visual cues to determine the meaning of unknown and multiple-meaning words on familiar and new topics. | a. Explain ideas, phenomena, processes, and relationships within and across texts (e.g., compare/contrast, cause/effect, themes, evidence-based argument) based on close reading of a variety of grade-level texts, presented in various print and multimedia formats, using a variety of detailed sentences and a range of general academic and domain-specific words. b. Explain inferences and conclusions drawn from close reading of grade-level texts and viewing of multimedia using a variety of verbs and adverbials (e.g., creates the impression that, consequently). c. Use knowledge of morphology (e.g., derivational suffixes), context, reference materials, and visual cues to determine the meaning, including figurative and connotative meanings, of unknown and multiple-meaning words on a variety of new topics. |
| Interpretive | ***Evaluating Language Choices*** | Explain how successfully writers and speakers structure texts and use language (e.g., specific word or phrasing choices) to persuade the reader (e.g., by providing evidence to support claims or connecting points in an argument) or create other specific effects, with substantial support. | Explain how successfully writers and speakers structure texts and use language (e.g., specific word or phrasing choices) to persuade the reader (e.g., by providing well-worded evidence to support claims or connecting points in an argument in specific ways) or create other specific effects, with moderate support. | Explain how successfully writers and speakers structure texts and use language (e.g., specific word or phrasing choices) to persuade the reader (e.g., by providing well-worded evidence to support claims or connecting points in an argument in specific ways) or create other specific effects, with light support. |
| Interpretive | ***Analyzing Language Choices*** | Explain how a writer's or speaker's choice of phrasing or specific words (e.g., describing a character or action as aggressive versus bold) produces nuances and different effects on the audience. | Explain how a writer's or speaker's choice of phrasing or specific words (e.g., using figurative language or words with multiple meanings to describe an event or character) produces nuances and different effects on the audience. | Explain how a writer's or speaker's choice of a variety of different types of phrasing or words (e.g., hyperbole, varying connotations, the cumulative impact of word choices) produces nuances and different effects on the audience. |
| Productive | ***Presenting*** | Plan and deliver brief oral presentations and reports on grade-appropriate topics that present evidence and facts to support ideas. | Plan and deliver a variety of oral presentations and reports on grade-appropriate topics that present evidence and facts to support ideas by using growing understanding of register. | Plan and deliver a variety of oral presentations and reports on grade-appropriate topics that express complex and abstract ideas well supported by evidence and sound reasoning, and are delivered using an appropriate level of formality and understanding of register. |
| Productive | ***Writing*** | a. Write short literary and informational texts (e.g., an argument about water rights) collaboratively (e.g., with peers) and independently. b. Write brief summaries of texts and experiences by using complete sentences and key words (e.g., from notes or graphic organizers). | a. Write longer literary and informational texts (e.g., an argument about water rights) collaboratively (e.g., with peers) and independently by using appropriate text organization and growing understanding of register. b. Write increasingly concise summaries of texts and experiences by using complete sentences and key words (e.g., from notes or graphic organizers). | a. Write longer and more detailed literary and informational texts (e.g., an argument about water rights) collaboratively (e.g., with peers) and independently using appropriate text organization and register. b. Write clear and coherent summaries of texts and experiences by using complete and concise sentences and key words (e.g., from notes or graphic organizers). |
| Productive | ***Justifying/ Arguing*** | a. Justify opinions by articulating some relevant textual evidence or background knowledge, with visual support. b. Express attitude and opinions or temper statements with familiar modal expressions (e.g., can, may). | a. Justify opinions and positions or persuade others by making connections between ideas and articulating relevant textual evidence or background knowledge. b. Express attitude and opinions or temper statements with a variety of familiar modal expressions (e.g., possibly/likely, could/ would). | a. Justify opinions or persuade others by making connections and distinctions between ideas and texts and articulating sufficient, detailed, and relevant textual evidence or background knowledge, using appropriate register. b. Express attitude and opinions or temper statements with nuanced modal expressions (e.g., possibly/ potentially/ certainly/ absolutely, should/might). |
| Productive | ***Selecting Language Resources*** | a. Use familiar general academic (e.g., temperature, document) and domain-specific (e.g., characterization, photosynthesis, society, quadratic functions) words to create clear spoken and written texts. b. Use knowledge of morphology to appropriately select basic affixes (e.g., The skull protects the brain). | a. Use an increasing variety of gradeappropriate general academic (e.g., dominate, environment) and domain-specific (e.g., characterization, photosynthesis, society, quadratic functions) academic words accurately and appropriately when producing increasingly complex written and spoken texts. b. Use knowledge of morphology to appropriately select affixes in a growing number of ways to manipulate language (e.g., Rosebushes' stems are branched or unbranched | a. Use a variety of grade-appropriate general (e.g., anticipate, transaction) and domain-specific (e.g., characterization, photosynthesis, society, quadratic functions) academic words and phrases, including persuasive language, accurately and appropriately when producing complex written and spoken texts. b. Use knowledge of morphology to appropriately select affixes in a variety of ways to manipulate language (e.g., changing humiliate to humiliation or incredible to incredibly). |

**Part II: Learning About How English Works**

| | | Emerging | Expanding | Bridging |
|---|---|---|---|---|
| *Structuring Cohesive Texts* | ***Understanding Text Structure*** | Apply analysis of the organizational structure of different text types (e.g., how arguments are organized by establishing clear relationships among claims, counterclaims, reasons, and evidence) to comprehending texts and to writing brief arguments, informative/explanatory texts and narratives. | Apply analysis of the organizational structure of different text types (e.g., how arguments are organized by establishing clear relationships among claims, counterclaims, reasons, and evidence) to comprehending texts and to writing increasingly clear and cohesive arguments, informative/ explanatory texts and narratives | Apply analysis of the organizational structure of different text types (e.g., how arguments are organized by establishing clear relationships among claims, counterclaims, reasons, and evidence) to comprehending texts and to writing clear and cohesive arguments, informative/explanatory texts and narratives. |
| *Structuring Cohesive Texts* | ***Understanding Cohesion*** | a. Apply knowledge of familiar language resources for referring to make texts more cohesive (e.g., using pronouns to refer back to nouns in text) to comprehending and writing brief texts. b. Apply knowledge of familiar language resources for linking ideas, events, or reasons throughout a text (e.g., using connecting/transition words and phrases, such as first, second, third) to comprehending and writing brief texts. | a. Apply knowledge of a growing number of language resources for referring to make texts more cohesive (e.g., using nominalizations to refer back to an action or activity described earlier) to comprehending texts and to writing increasingly cohesive texts for specific purposes and audiences. b. Apply knowledge of familiar language resources for linking ideas, events, or reasons throughout a text (e.g., using connecting/transition words and phrases, such as meanwhile, however, on the other hand) to comprehending texts and to writing increasingly cohesive texts for specific purposes and audiences. | a. Apply knowledge of a variety of language resources for referring to make texts more cohesive (e.g., using nominalization, paraphrasing, or summaries to reference or recap an idea or explanation provided earlier) to comprehending grade-level texts and to writing clear and cohesive grade-level texts for specific purposes and audiences. b. Apply knowledge of familiar language resources for linking ideas, events, or reasons throughout a text (e.g., using connecting/transition words and phrases, such as on the contrary, in addition, moreover) to comprehending grade-level texts and to writing cohesive texts for specific purposes and audiences. |
| *Expanding and Enriching Ideas* | ***Using Verbs and Verb Phrases*** | Use a variety of verbs in different tenses (e.g., past, present, future, simple, progressive) appropriate to the text type and discipline to create short texts on familiar academic topics. | Use a variety of verbs in different tenses (e.g., past, present, future, simple, progressive, perfect) appropriate to the text type and discipline to create a variety of texts that explain, describe, and summarize concrete and abstract thoughts and ideas. | Use a variety of verbs in different tenses (e.g., past, present, future, simple, progressive, perfect), and mood (e.g., subjunctive) appropriate to the text type and discipline to create a variety of texts that describe concrete and abstract ideas, explain procedures and sequences, summarize texts and ideas, and present and critique points of view |
| *Expanding and Enriching Ideas* | ***Using Nouns and Noun Phrases*** | Expand noun phrases to create increasingly detailed sentences (e.g., adding adjectives for precision) about personal and familiar academic topics. | Expand noun phrases in a growing number of ways (e.g., adding adjectives to nouns, simple clause embedding) to create detailed sentences that accurately describe, explain, and summarize information and ideas on a variety of personal and academic topics. | Expand noun phrases in a variety of ways (e.g., more complex clause embedding) to create detailed sentences that accurately describe concrete and abstract ideas, explain procedures and sequences, summarize texts and ideas, and present and critique points of view on a variety of academic topics. |
| *Expanding and Enriching Ideas* | ***Modifying to Add Details*** | Expand sentences with simple adverbials (e.g., adverbs, adverb phrases, prepositional phrases) to provide details (e.g., time, manner, place, cause) about familiar activities or processes. | Expand sentences with a growing variety of adverbials (e.g., adverbs, adverb phrases, prepositional phrases) to provide details (e.g., time, manner, place, cause) about familiar or new activities or processes. | Expand sentences with a variety of adverbials (e.g., adverbs, adverb phrases and clauses, prepositional phrases) to provide details (e.g., time, manner, place, cause) about a variety of familiar and new activities and processes. |
| *Connecting and Condensing Ideas* | ***Connecting Ideas*** | Combine clauses in a few basic ways (e.g., creating compound sentences using and, but, so; creating complex sentences using because) to make connections between and to join ideas (e.g., I want to read this book because it describes the solar system). | Combine clauses in a growing number of ways to create compound and complex sentences that make connections between and link concrete and abstract ideas, for example, to express a reason (e.g., He stayed at home on Sunday in order to study for Monday's exam) or to make a concession (e.g., She studied all night even though she wasn't feeling well). | Combine clauses in a variety of ways to create compound and complex sentences that make connections between and link concrete and abstract ideas, for example, to make a concession (e.g., While both characters strive for success, they each take different approaches through which to reach their goals.), or to establish cause (e.g., Women's lives were changed forever after World War II as a result of joining the workforce). |
| *Connecting and Condensing Ideas* | ***Condensing Ideas*** | Condense ideas in a few basic ways (e.g., by compounding verb or prepositional phrases) to create precise and detailed simple, compound, and complex sentences (e.g., The students asked survey questions and recorded the responses). | Condense ideas in a growing number of ways (e.g., through embedded clauses or by compounding verbs or prepositional phrases) to create more precise and detailed simple, compound, and complex sentences (e.g., Species that could not adapt to the changing climate eventually disappeared). | Condense ideas in a variety of ways (e.g., through a variety of embedded clauses, or by compounding verbs or prepositional phrases, nominalization) to create precise simple, compound, and complex sentences that condense concrete and abstract ideas (e.g., Another issue that people may be concerned with is the amount of money that it will cost to construct the new building). |

## ELD Standards Grades 11-12

### Part I: Interacting in Meaningful Ways

| | | Emerging | Expanding | Bridging |
|---|---|---|---|---|
| Collaborative | *Exchanging information/ideas* | Engage in conversational exchanges and express ideas on familiar current events and academic topics by asking and answering yes-no questions and wh- questions and responding using phrases and short sentences. | Contribute to class, group, and partner discussions, sustaining conversations on a variety of age and grade-appropriate academic topics by following turn-taking rules, asking and answering relevant, on-topic questions, affirming others, providing additional, relevant information, and paraphrasing key ideas. | Contribute to class, group, and partner discussions, sustaining conversations on a variety of age and grade-appropriate academic topics by following turn-taking rules, asking and answering relevant, on-topic questions, affirming others, and providing coherent and well-articulated comments and additional information. |
| Collaborative | *Interacting via written English* | Collaborate with peers to engage in short, grade-appropriate written exchanges and writing projects, using technology as appropriate. | Collaborate with peers to engage in increasingly complex grade-appropriate written exchanges and writing projects, using technology as appropriate. | Collaborate with peers to engage in a variety of extended written exchanges and complex grade-appropriate writing projects, using technology as appropriate. |
| Collaborative | *Supporting opinions and persuading others* | Negotiate with or persuade others in conversations (e.g., ask for clarification or repetition) using learned phrases (e.g., Could you repeat that please? I believe . . . ) and open responses to express and defend opinions. | Negotiate with and persuade others (e.g., by presenting counter-arguments) in discussions and conversations using learned phrases (e.g., You make a valid point, but my view is . . . ) and open responses to express and defend nuanced opinions. | Negotiate with or persuade others in discussions and conversations in appropriate registers (e.g., to acknowledge new information and politely offer a counterpoint) using a variety of learned phrases (e.g., You postulate that X. However, I've reached a different conclusion on this issue) and open responses to express and defend nuanced opinions. |
| Collaborative | *Adapting language choices* | Adjust language choices according to the context (e.g., classroom, community) and audience (e.g., peers, teachers). | Adjust language choices according to the context (e.g., classroom, community), purpose (e.g., to persuade, to provide arguments or counterarguments), task, and audience (e.g., peers, teachers, guest lecturer). | Adjust language choices according to the task (e.g., group presentation of research project), context (e.g., classroom, community), purpose (e.g., to persuade, to provide arguments or counterarguments), and audience (e.g., peers, teachers, college recruiter). |
| Interpretive | *Listening Actively* | Demonstrate comprehension of oral presentations and discussions on familiar social and academic topics by asking and answering questions with prompting and substantial support. | Demonstrate comprehension of oral presentations and discussions on a variety of social and academic topics by asking and answering questions that show thoughtful consideration of the ideas or arguments with moderate support. | Demonstrate comprehension of oral presentations and discussions on a variety of social and academic topics by asking and answering detailed and complex questions that show thoughtful consideration of the ideas or arguments with light support. |
| Interpretive | *Reading/Viewing Closely* | a. Explain ideas, phenomena, processes, and text relationships (e.g., compare/contrast, cause/effect, evidence-based argument) based on close reading of a variety of grade-appropriate texts, presented in various print and multimedia formats, using phrases, short sentences, and a select set of general academic and domain-specific words. b. Explain inferences and conclusions drawn from close reading of grade-appropriate texts and viewing of multimedia, using familiar verbs (e.g., seems that). c. Use knowledge of morphology (e.g., common prefixes and suffixes), context, reference materials, and visual cues to determine the meaning of unknown and multiple-meaning words on familiar topics. | a. Explain ideas, phenomena, processes, and relationships within and across texts (e.g., compare/contrast, cause/effect, themes, evidence-based argument) based on close reading of a variety of grade-appropriate texts, presented in various print and multimedia formats, using increasingly detailed sentences, and a range of general academic and domain-specific words. b. Explain inferences and conclusions drawn from close reading of grade-appropriate texts and viewing of multimedia using a variety of verbs and adverbials (e.g., indicates that, suggests, as a result). c. Use knowledge of morphology (e.g., affixes, Greek and Latin roots), context, reference materials, and visual cues to determine the meaning of unknown and multiple-meaning words on familiar and new topics. | a. Explain ideas, phenomena, processes, and relationships within and across texts (e.g., compare/contrast, cause/effect, themes, evidence-based argument) based on close reading of a variety of grade-level texts, presented in various print and multimedia formats, using a variety of detailed sentences and precise general academic and domain-specific words. b. Explain inferences and conclusions drawn from close reading of grade-level texts and viewing of multimedia using a variety of verbs and adverbials (e.g., creates the impression that, consequently). c. Use knowledge of morphology (e.g., derivational suffixes), context, reference materials, and visual cues to determine the meaning, including figurative and connotative meanings, of unknown and multiple-meaning words on a variety of new topics. |
| Interpretive | *Evaluating Language Choices* | Explain how successfully writers and speakers structure texts and use language (e.g., specific word or phrasing choices) to persuade the reader (e.g., by providing evidence to support claims or connecting points in an argument) or create other specific effects. | Explain how successfully writers and speakers structure texts and use language (e.g., specific word or phrasing choices) to persuade the reader (e.g., by providing well-worded evidence to support claims or connecting points in an argument in specific ways) or create other specific effects, with moderate support. | Explain how successfully writers and speakers structure texts and use language (e.g., specific word or phrasing choices) to persuade the reader (e.g., by providing well-worded evidence to support claims or connecting points in an argument in specific ways) or create other specific effects, with light support. |
| Interpretive | *Analyzing Language Choices* | Explain how a writer's or speaker's choice of phrasing or specific words (e.g., describing a character or action as aggressive versus bold) produces nuances or different effects on the audience. | Explain how a writer's or speaker's choice of phrasing or specific words (e.g., using figurative language or words with multiple meanings to describe an event or character) produces nuances and different effects on the audience. | Explain how a writer's or speaker's choice of a variety of different types of phrasing or words (e.g., hyperbole, varying connotations, the cumulative impact of word choices) produces nuances and different effects on the audience. |
| Productive | *Presenting* | Plan and deliver brief oral presentations and reports on grade-appropriate topics that present evidence and facts to support ideas. | Plan and deliver a variety of oral presentations and reports on grade-appropriate topics that present evidence and facts to support ideas by using growing understanding of register. | Plan and deliver a variety of oral presentations and reports on grade-appropriate topics that express complex and abstract ideas well supported by evidence and reasoning, and are delivered by using an appropriate level of formality and understanding of register. |
| Productive | *Writing* | a. Write short literary and informational texts (e.g., an argument about free speech) collaboratively (e.g., with peers) and independently. b. Write brief summaries of texts and experiences by using complete sentences and key words (e.g., from notes or graphic organizers). | a. Write longer literary and informational texts (e.g., an argument about free speech) collaboratively (e.g., with peers) and independently by using appropriate text organization and growing understanding of register. b. Write increasingly concise summaries of texts and experiences by using complete sentences and key words (e.g., from notes or graphic organizers). | a. Write longer and more detailed literary and informational texts (e.g., an argument about free speech) collaboratively (e.g., with peers) and independently by using appropriate text organization and register. b. Write clear and coherent summaries of texts and experiences by using complete and concise sentences and key words (e.g., from notes or graphic organizers). |
| Productive | *Justifying/Arguing* | a. Justify opinions by articulating some textual evidence or background knowledge with visual support. b. Express attitude and opinions or temper statements with familiar modal expressions (e.g., can, may). | a. Justify opinions and positions or persuade others by making connections between ideas and articulating relevant textual evidence or background knowledge. b. Express attitude and opinions or temper statements with a variety of familiar modal expressions (e.g., possibly/likely, could/would). | a. Justify opinions or persuade others by making connections and distinctions between ideas and texts and articulating sufficient, detailed, and relevant textual evidence or background knowledge by using appropriate register. b. Express attitude and opinions or temper statements with nuanced modal expressions (e.g., possibly/potentially/certainly/ absolutely, should/might). |
| Productive | *Selecting Language Resources* | a. Use familiar general academic (e.g., temperature, document) and domain-specific (e.g., cell, the Depression) words to create clear spoken and written texts. b. Use knowledge of morphology to appropriately select basic affixes (e.g., The news media relies on official sources). | a. Use an increasing variety of grade-appropriate general academic (e.g., fallacy, dissuade) and domain-specific (e.g., chromosome, federalism) academic words accurately and appropriately when producing increasingly complex written and spoken texts. b. Use knowledge of morphology to appropriately select affixes in a growing number of ways to manipulate language (e.g., The cardiac muscle works continuously.). | a. Use a variety of grade-appropriate general (e.g., alleviate, salutary) and domain-specific (e.g., soliloquy, microorganism) academic words and phrases, including persuasive language, accurately and appropriately when producing complex written and spoken texts. b. Use knowledge of morphology to appropriately select affixes in a variety of ways to manipulate language (e.g., changing inaugurate to inauguration). |

### Part II: Learning About How English Works

| | | Emerging | Expanding | Bridging |
|---|---|---|---|---|
| Structuring Cohesive Texts | *Understanding Text Structure* | Apply analysis of the organizational structure of different text types (e.g., how arguments are organized by establishing clear relationships among claims, counterclaims, reasons, and evidence) to comprehending texts and to writing brief arguments, informative/explanatory texts, and narratives. | Apply analysis of the organizational structure of different text types (e.g., how arguments are organized by establishing clear relationships among claims, counterclaims, reasons, and evidence) to comprehending texts and to writing increasingly clear and cohesive arguments, informative/explanatory texts, and narratives. | Apply analysis of the organizational structure of different text types (e.g., how arguments are organized by establishing clear relationships among claims, counterclaims, reasons, and evidence) to comprehending texts and to writing increasingly clear and cohesive arguments, informative/explanatory texts, and narratives. |
| Structuring Cohesive Texts | *Understanding Cohesion* | a. Apply knowledge of familiar language resources for referring to make texts more cohesive (e.g., using pronouns or synonyms to refer back to characters or concepts introduced earlier) to comprehending and writing brief texts. b. Apply knowledge of familiar language resources for linking ideas, events, or reasons throughout a text (e.g., using connecting/transition words and phrases, such as first, second, finally) to comprehending and writing brief texts. | a. Apply knowledge of a growing number of language resources for referring to make texts more cohesive (e.g., using nominalizations to refer back to an action or activity described earlier) to comprehending texts and to writing increasingly cohesive texts for specific purposes and audiences. b. Apply knowledge of familiar language resources for linking ideas, events, or reasons throughout a text (e.g., using connecting/ transition words and phrases, such as meanwhile, however, on the other hand) to comprehending texts and to writing increasingly cohesive texts for specific purposes and audiences. | a. Apply knowledge of a variety of resources for referring to make texts more cohesive (e.g., using nominalization, paraphrases, or summaries to reference or recap an idea or explanation provided earlier) to comprehending grade-level texts and to writing clear and cohesive texts for specific purposes and audiences. b. Apply knowledge of familiar language resources for linking ideas, events, or reasons throughout a text (e.g., using connecting/ transition words and phrases, such as on the contrary, in addition, moreover) to comprehending grade-level texts and writing cohesive texts for specific purposes and audiences. |
| Expanding and Enriching Ideas | *Using Verbs and Verb Phrases* | Use a variety of verbs in different tenses (e.g., past, present, future, simple, progressive) appropriate to the text type and discipline to create short texts on familiar academic topics. | Use a variety of verbs in different tenses (e.g., past, present, future, simple, progressive, perfect) appropriate to the text type and discipline to create a variety of texts that explain, describe, and summarize concrete and abstract thoughts and ideas. | Use a variety of verbs in different tenses (e.g., past, present, future, simple, progressive, perfect), and mood (e.g., subjunctive) appropriate to the text type and discipline to create a variety of texts that describe concrete and abstract ideas, explain procedures and sequences, summarize texts and ideas, and present and critique points of view. |
| Expanding and Enriching Ideas | *Using Nouns and Noun Phrases* | Expand noun phrases to create increasingly detailed sentences (e.g., adding adjectives for precision) about personal and familiar academic topics. | Expand noun phrases in a growing number of ways (e.g., adding adjectives to nouns, simple clause embedding) to create detailed sentences that accurately describe, explain, and summarize information and ideas on a variety of personal and academic topics. | Expand noun phrases in a variety of ways (e.g., complex clause embedding) to create detailed sentences that accurately describe concrete and abstract ideas, explain procedures and sequences, summarize texts and ideas, and present and critique points of view on a variety of academic topics. |
| Expanding and Enriching Ideas | *Modifying to Add Details* | Expand sentences with simple adverbials (e.g., adverbs, adverb phrases, prepositional phrases) to provide details (e.g., time, manner, place, cause) about familiar activities or processes. | Expand sentences with a growing variety of adverbials (e.g., adverbs, adverb phrases, prepositional phrases) to provide details (e.g., time, manner, place, cause) about familiar or new activities or processes. | Expand sentences with a variety of adverbials (e.g., adverbs, adverb phrases and clauses, prepositional phrases) to provide details (e.g., time, manner, place, cause) about a variety of familiar and new activities and processes. |
| Connecting and Condensing Ideas | *Connecting Ideas* | Combine clauses in a few basic ways (e.g., creating compound sentences using and, but, so; creating complex sentences using because) to make connections between and join ideas (e.g., I want to read this book because it tells the history of Pi). | Combine clauses in a growing number of ways to create compound and complex sentences that make connections between and link concrete and abstract ideas, for example, to express a reason (e.g., He stayed at home on Sunday in order to study for Monday's exam) or to make a concession (e.g., She studied all night even though she wasn't feeling well). | Combine clauses in a variety of ways to create compound and complex sentences that make connections between and link concrete and abstract ideas, for example, to make a concession (e.g., While both characters strive for success, they each take different approaches to reach their goals), or to establish cause (e.g., Women's lives were changed forever after World War II as a result of joining the workforce). |
| Connecting and Condensing Ideas | *Condensing Ideas* | Condense ideas in a few basic ways (e.g., by compounding verb or prepositional phrases) to create precise and detailed simple, compound, and complex sentences (e.g., The students asked survey questions and recorded the responses). | Condense ideas in a growing number of ways (e.g., through embedded clauses or by compounding verb or prepositional phrases) to create more precise and detailed simple, compound, and complex sentences (e.g., Species that could not adapt to the changing climate eventually disappeared). | Condense ideas in a variety of ways (e.g., through a variety of embedded clauses, or by compounding verb or prepositional phrases, nominalization) to create precise simple, compound, and complex sentences that condense concrete and abstract ideas (e.g., The epidemic, which ultimately affected hundreds of thousands of people, did not subside for another year). |

# HS-PS1 Matter and Its Interactions

**HS-PS1 Matter and Its Interactions**

Students who demonstrate understanding can:

**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.** [Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.] [Assessment Boundary: Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.]

**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.** [Clarification Steatement: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.] [Assessment Boundary: Assessment is limited to chemical reactions involving main group elements and combustion reactions.]

**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.** [Clarification Statement: Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.] [Assessment Boundary: Assessment does not include Raoult's law calculations of vapor pressure.]

**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.** [Clarification Statement: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.] [Assessment Boundary: Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.]

**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.** [Clarification Statement: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.] [Assessment Boundary: Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.]

**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.*** [Clarification Statement: Emphasis is on the application of Le Chatelier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products.] [Assessment Boundary: Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.]

**HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.** [Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.] [Assessment Boundary: Assessment does not include complex chemical reactions.]

**HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.** [Clarification Statement: Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.] [Assessment Boundary: Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Developing and Using Models**

Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

- Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS1-4),(HS-PS1-8)
- Use a model to predict the relationships between systems or between components of a system. (HS-PS1-1)

**Planning and Carrying Out Investigations**

Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS1-3)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on

## Disciplinary Core Ideas

**PS1.A: Structure and Properties of Matter**

- Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (HS-PS1-1)
- The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (HS-PS1-1),(HS-PS1-2)
- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (HS-PS1-3),*(secondary to HS-PS2-6)*
- A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart. (HS-PS1-4)

**PS1.B: Chemical Reactions**

- Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy. (HS-PS1-4),(HS-PS1-5)
- In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. (HS-PS1-6)
- The fact that atoms are conserved, together with knowledge of the chemical properties of the elements

## Crosscutting Concepts

**Patterns**

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-PS1-1),(HS-PS1-2),(HS-PS1-3),(HS-PS1-5)

**Energy and Matter**

- In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. (HS-PS1-8)
- The total amount of energy and matter in closed systems is conserved. (HS-PS1-7)
- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-PS1-4)

**Stability and Change**

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-PS1-6)

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*Connections to Nature of Science*

**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**

- Science assumes the universe is a vast single system in which basic laws are

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas. Integrated and reprinted with permission from the National Academy of Sciences.

| | | |
|---|---|---|
| mathematical models of basic assumptions.<br>▪ Use mathematical representations of phenomena to support claims. (HS-PS1-7)<br>**Constructing Explanations and Designing Solutions**<br>Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.<br>▪ Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects. (HS-PS1-5)<br>▪ Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-PS1-2)<br>▪ Refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-PS1-6) | involved, can be used to describe and predict chemical reactions. (HS-PS1-2),(HS-PS1-7)<br>**PS1.C: Nuclear Processes**<br>▪ Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process. (HS-PS1-8)<br>**PS1.A: Structure and Properties of Matter**<br>▪ Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. *(secondary to HS-PS1-1),(secondary to HS-PS1-3)*<br>**ETS1.C: Optimizing the Design Solution**<br>▪ Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. *(secondary to HS-PS1-6)* | consistent. (HS-PS1-7) |

*Connections to other DCIs in this grade-band:* **HS.PS3.A** (HS-PS1-4),(HS-PS1-5),(HS-PS1-8); **HS.PS3.B** (HS-PS1-4),(HS-PS1-6),(HS-PS1-7),(HS-PS1-8); **HS.PS3.C** (HS-PS1-8); **HS.PS3.D** (HS-PS1-4),(HS-PS1-8); **HS.LS1.C** (HS-PS1-1),(HS-PS1-2),(HS-PS1-4),(HS-PS1-7); **HS.LS2.B** (HS-PS1-7); **HS.ESS1.A** (HS-PS1-8); **HS.ESS1.C** (HS-PS1-8); **HS.ESS2.C** (HS-PS1-2),(HS-PS1-3)

*Articulation to DCIs across grade-bands:* **MS.PS1.A** (HS-PS1-1),(HS-PS1-2),(HS-PS1-3),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7),(HS-PS1-8); **MS.PS1.B** (HS-PS1-1),(HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-6),(HS-PS1-7),(HS-PS1-8); **MS.PS1.C** (HS-PS1-8); **MS.PS2.B** (HS-PS1-3),(HS-PS1-4),(HS-PS1-5); **MS.PS3.A** (HS-PS1-5); **MS.PS3.B** (HS-PS1-5); **MS.PS3.D** (HS-PS1-4); **MS.LS1.C** (HS-PS1-4),(HS-PS1-7); **MS.LS2.B** (HS-PS1-7); **MS.ESS2.A** (HS-PS1-7),(HS-PS1-8)

*Common Core State Standards Connections:*

*ELA/Literacy –*

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| **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. *(HS-PS1-1)* |
| **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. (HS-PS1-3),(HS-PS1-5) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS1-2),*(HS-PS1-5)* |
| **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. (HS-PS1-2) |
| **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. (HS-PS1-3),*(HS-PS1-6)* |
| **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. (HS-PS1-3) |
| **WHST.9-12.9** | Draw evidence from informational texts to support analysis, reflection, and research. *(HS-PS1-3)* |
| **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. *(HS-PS1-4)* |

*Mathematics –*

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|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-PS1-5),(HS-PS1-7) |
| **MP.4** | Model with mathematics. *(HS-PS1-4),(HS-PS1-8)* |
| **HSN-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. (HS-PS1-2),*(HS-PS1-3),(HS-PS1-4),(HS-PS1-5)*,(HS-PS1-7),(HS-PS1-8) |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. (HS-PS1-4),*(HS-PS1-7)*,(HS-PS1-8) |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. *(HS-PS1-2),(HS-PS1-3),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7),(HS-PS1-8)* |

# HS-PS2 Motion and Stability: Forces and Interactions

**HS-PS2 Motion and Stability: Forces and Interactions**

Students who demonstrate understanding can:

**HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.** [Clarification Statement: Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force.] [Assessment Boundary: Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.]

**HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.** [Clarification Statement: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle.] [Assessment Boundary: Assessment is limited to systems of two macroscopic bodies moving in one dimension.]

**HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*** [Clarification Statement: Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute.] [Assessment Boundary: Assessment is limited to qualitative evaluations and/or algebraic manipulations.]

**HS-PS2-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.** [Clarification Statement: Emphasis is on both quantitative and conceptual descriptions of gravitational and electric fields.] [Assessment Boundary: Assessment is limited to systems with two objects.]

**HS-PS2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.** [Assessment Boundary: Assessment is limited to designing and conducting investigations with provided materials and tools.]

**HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.*** [Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.] [Assessment Boundary: Assessment is limited to provided molecular structures of specific designed materials.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Planning and Carrying Out Investigations**

Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS2-5)

**Analyzing and Interpreting Data**

Analyzing data in 9–12 builds on K–8 and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. (HS-PS2-1)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical representations of phenomena to describe explanations. (HS-PS2-2),(HS-PS2-4)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects. (HS-PS2-3)

**Obtaining, Evaluating, and Communicating Information**

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats

## Disciplinary Core Ideas

**PS1.A: Structure and Properties of Matter**

- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (secondary to HS-PS2-6)

**PS2.A: Forces and Motion**

- Newton's second law accurately predicts changes in the motion of macroscopic objects. (HS-PS2-1)
- Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. (HS-PS2-2)
- If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. (HS-PS2-2),(HS-PS2-3)

**PS2.B: Types of Interactions**

- Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. (HS-PS2-4)
- Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (HS-PS2-4),(HS-PS2-5)
- Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (HS-PS2-6),*(secondary to HS-PS1-1)*,*(secondary to HS-PS1-3)*

**PS3.A: Definitions of Energy**

- "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents. *(secondary to HS-PS2-5)*

**ETS1.A: Defining and Delimiting Engineering Problems**

- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. *(secondary to HS-PS2-3)*

**ETS1.C: Optimizing the Design Solution**

- Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. *(secondary to HS-PS2-3)*

## Crosscutting Concepts

**Patterns**

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-PS2-4)

**Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-PS2-1),(HS-PS2-5)
- Systems can be designed to cause a desired effect. (HS-PS2-3)

**Systems and System Models**

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined. (HS-PS2-2)

**Structure and Function**

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-PS2-6)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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| (including orally, graphically, textually, and mathematically). (HS-PS2-6)<br>----------------------------------------------------<br>***Connections to Nature of Science***<br>**Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**<br>▪ Theories and laws provide explanations in science. (HS-PS2-1),(HS-PS2-4)<br>▪ Laws are statements or descriptions of the relationships among observable phenomena. (HS-PS2-1),(HS-PS2-4) | | |

*Connections to other DCIs in this grade-band:* **HS.PS3.A** (HS-PS2-4),(HS-PS2-5); **HS.PS3.C** (HS-PS2-1); **HS.PS4.B** (HS-PS2-5); **HS.ESS1.A** (HS-PS2-1),(HS-PS2-2),(HS-PS2-4); **HS.ESS1.B** (HS-PS2-4); **HS.ESS1.C** (HS-PS2-1),(HS-PS2-2),(HS-PS2-4); **HS.ESS2.A** (HS-PS2-5); **HS.ESS2.C** (HS-PS2-1),(HS-PS2-4); **HS.ESS3.A** (HS-PS2-4),(HS-PS2-5)

*Articulation to DCIs across grade-bands:* **MS.PS1.A** (HS-PS2-6); **MS.PS2.A** (HS-PS2-1),(HS-PS2-2),(HS-PS2-3); **MS.PS2.B** (HS-PS2-4),(HS-PS2-5),(HS-PS2-6); **MS.PS3.C** (HS-PS2-1),(HS-PS2-2),(HS-PS2-3); **MS.ESS1.B** (HS-PS2-4),(HS-PS2-5)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. *(HS-PS2-1),(HS-PS2-6)* |
| **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. (HS-PS2-1) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-PS2-6)* |
| **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. (HS-PS2-3),(HS-PS2-5) |
| **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. *(HS-PS2-5)* |
| **WHST.9-12.9** | Draw evidence from informational texts to support analysis, reflection, and research. *(HS-PS2-1),(HS-PS2-5)* |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4) |
| **MP.4** | Model with mathematics. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4) |
| **HSN-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. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4),*(HS-PS2-5),(HS-PS2-6)* |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. *(HS-PS2-1),(HS-PS2-2),(HS-PS2-4),(HS-PS2-5),(HS-PS2-6)* |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS2-1),(HS-PS2-2),(HS-PS2-4),*(HS-PS2-5),(HS-PS2-6)* |
| **HSA-SSE.A.1** | Interpret expressions that represent a quantity in terms of its context. (HS-PS2-1),(HS-PS2-4) |
| **HSA-SSE.B.3** | Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. (HS-PS2-1),(HS-PS2-4) |
| **HSA-CED.A.1** | Create equations and inequalities in one variable and use them to solve problems. (HS-PS2-1),(HS-PS2-2) |
| **HSA-CED.A.2** | Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *(HS-PS2-1),(HS-PS2-2)* |
| **HSA-CED.A.4** | Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *(HS-PS2-1),(HS-PS2-2)* |
| **HSF-IF.C.7** | Graph functions expressed symbolically and show key features of the graph, by in hand in simple cases and using technology for more complicated cases. *(HS-PS2-1)* |
| **HSS-ID.A.1** | Represent data with plots on the real number line (dot plots, histograms, and box plots). *(HS-PS2-1)* |

  

# HS-PS3 Energy

**HS-PS3 Energy**

Students who demonstrate understanding can:

**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.** [Clarification Statement: Emphasis is on explaining the meaning of mathematical expressions used in the model.] [Assessment Boundary: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.]

**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).** [Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.]

**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.*** [Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.] [Assessment Boundary: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.]

**HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).** [Clarification Statement: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.] [Assessment Boundary: Assessment is limited to investigations based on materials and tools provided to students.]

**HS-PS3-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.** [Clarification Statement: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.] [Assessment Boundary: Assessment is limited to systems containing two objects.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Developing and Using Models**

Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS3-2),(HS-PS3-5)

**Planning and Carrying Out Investigations**

Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS3-4)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Create a computational model or simulation of a phenomenon, designed device, process, or system. (HS-PS3-1)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Design, evaluate, and/or refine a solution to a

## Disciplinary Core Ideas

**PS3.A: Definitions of Energy**

- Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (HS-PS3-1),(HS-PS3-2)
- At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (HS-PS3-2) (HS-PS3-3)
- These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (HS-PS3-2)

**PS3.B: Conservation of Energy and Energy Transfer**

- Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (HS-PS3-1)
- Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (HS-PS3-1),(HS-PS3-4)
- Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (HS-PS3-1)
- The availability of energy limits what can occur in any system. (HS-PS3-1)
- Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down). (HS-PS3-4)

**PS3.C: Relationship Between Energy and Forces**

- When two objects interacting through a field change relative position, the energy stored in the field is changed. (HS-PS3-5)

**PS3.D: Energy in Chemical Processes**

- Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the

## Crosscutting Concepts

**Cause and Effect**

- Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system. (HS-PS3-5)

**Systems and System Models**

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-PS3-4)
- Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models. (HS-PS3-1)

**Energy and Matter**

- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-PS3-3)
- Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems. (HS-PS3-2)

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***Connections to Engineering, Technology, and Applications of Science***

**Influence of Science, Engineering, and Technology on Society and the Natural World**

- Modern civilization depends on major technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-PS3-3)

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***Connections to Nature of Science***

**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

| | | |
|---|---|---|
| complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-PS3-3) | surrounding environment. (HS-PS3-3),(HS-PS3-4)<br>**ETS1.A: Defining and Delimiting Engineering Problems**<br>▪ Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. *(secondary to HS-PS3-3)* | ▪ Science assumes the universe is a vast single system in which basic laws are consistent. (HS-PS3-1) |

*Connections to other DCIs in this grade-band:* **HS.PS1.A** (HS-PS3-2); **HS.PS1.B** (HS-PS3-1),(HS-PS3-2); **HS.PS2.B** (HS-PS3-2),(HS-PS3-5); **HS.LS2.B** (HS-PS3-1); **HS.ESS1.A** (HS-PS3-1),(HS-PS3-4); **HS.ESS2.A** (HS-PS3-1),(HS-PS3-2),(HS-PS3-4); **HS.ESS2.D** (HS-PS3-4); **HS.ESS3.A** (HS-PS3-3)

*Articulation to DCIs across grade-bands:* **MS.PS1.A** (HS-PS3-2); **MS.PS2.B** (HS-PS3-2),(HS-PS3-5); **MS.PS3.A** (HS-PS3-1),(HS-PS3-2),(HS-PS3-3); **MS.PS3.B** (HS-PS3-1),(HS-PS3-3),(HS-PS3-4); **MS.PS3.C** (HS-PS3-2),(HS-PS3-5); **MS.ESS2.A** (HS-PS3-1),(HS-PS3-3)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. *(HS-PS3-4)* |
| **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. *(HS-PS3-3),* (HS-PS3-4),*(HS-PS3-5)* |
| **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. (HS-PS3-4),*(HS-PS3-5)* |
| **WHST.9-12.9** | Draw evidence from informational texts to support analysis, reflection, and research. *(HS-PS3-4),(HS-PS3-5)* |
| **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. *(HS-PS3-1),(HS-PS3-2),(HS-PS3-5)* |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-PS3-1),(HS-PS3-2),(HS-PS3-3),(HS-PS3-4),(HS-PS3-5) |
| **MP.4** | Model with mathematics. (HS-PS3-1),(HS-PS3-2),(HS-PS3-3),*(HS-PS3-4),*(HS-PS3-5) |
| **HSN-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. (HS-PS3-1),(HS-PS3-3) |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. (HS-PS3-1),(HS-PS3-3) |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS3-1),(HS-PS3-3) |

  

# HS-PS4 Waves and Their Applications in Technologies for Information Transfer

**HS-PS4 Waves and Their Applications in Technologies for Information Transfer**

Students who demonstrate understanding can:

**HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.** [Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.]

**HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information.** [Clarification Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.]

**HS-PS4-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.** [Clarification Statement: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect.] [Assessment Boundary: Assessment does not include using quantum theory.]

**HS-PS4-4. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.** [Clarification Statement: Emphasis is on the idea that photons associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.] [Assessment Boundary: Assessment is limited to qualitative descriptions.]

**HS-PS4-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.*** [Clarification Statement: Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology.] [Assessment Boundary: Assessments are limited to qualitative information. Assessments do not include band theory.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Asking Questions and Defining Problems**

Asking questions and defining problems in grades 9–12 builds from grades K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

- Evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of a design. (HS-PS4-2)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking at the 9-12 level builds on K-8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations. (HS-PS4-1)

**Engaging in Argument from Evidence**

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed worlds. Arguments may also come from current scientific or historical episodes in science.

- Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-PS4-3)

**Obtaining, Evaluating, and Communicating Information**

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- Evaluate the validity and reliability of multiple claims that appear in scientific and technical texts or media reports, verifying the data when possible. (HS-PS4-4)
- Communicate technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-PS4-5)

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*Connections to Nature of Science*

**Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**

- A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-PS4-3)

## Disciplinary Core Ideas

**PS3.D: Energy in Chemical Processes**

- Solar cells are human-made devices that likewise capture the sun's energy and produce electrical energy. *(secondary to HS-PS4-5)*

**PS4.A: Wave Properties**

- The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. (HS-PS4-1)
- Information can be digitized (e.g., a picture stored as the values of an array of pixels); in this form, it can be stored reliably in computer memory and sent over long distances as a series of wave pulses. (HS-PS4-2),(HS-PS4-5)
- [From the 3–5 grade band endpoints] Waves can add or cancel one another as they cross, depending on their relative phase (i.e., relative position of peaks and troughs of the waves), but they emerge unaffected by each other. (Boundary: The discussion at this grade level is qualitative only; it can be based on the fact that two different sounds can pass a location in different directions without getting mixed up.) (HS-PS4-3)

**PS4.B: Electromagnetic Radiation**

- Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. (HS-PS4-3)
- When light or longer wavelength electromagnetic radiation is absorbed in matter, it is generally converted into thermal energy (heat). Shorter wavelength electromagnetic radiation (ultraviolet, X-rays, gamma rays) can ionize atoms and cause damage to living cells. (HS-PS4-4)
- Photoelectric materials emit electrons when they absorb light of a high-enough frequency. (HS-PS4-5)

**PS4.C: Information Technologies and Instrumentation**

- Multiple technologies based on the understanding of waves and their interactions with matter are part of everyday experiences in the modern world (e.g., medical imaging, communications, scanners) and in scientific research. They are essential tools for producing, transmitting, and capturing signals and for storing and interpreting the information contained in them. (HS-PS4-5)

## Crosscutting Concepts

**Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-PS4-1)
- Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system. (HS-PS4-4)
- Systems can be designed to cause a desired effect. (HS-PS4-5)

**Systems and System Models**

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-PS4-3)

**Stability and Change**

- Systems can be designed for greater or lesser stability. (HS-PS4-2)

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*Connections to Engineering, Technology, and Applications of Science*

**Interdependence of Science, Engineering, and Technology**

- Science and engineering complement each other in the cycle known as research and development (R&D). (HS-PS4-5)

**Influence of Engineering, Technology, and Science on Society and the Natural World**

- Modern civilization depends on major technological systems. (HS-PS4-2),(HS-PS4-5)
- Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-PS4-2)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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# HS-PS4 Waves and Their Applications in Technologies for Information Transfer

*Connections to other DCIs in this grade-band:* **HS.PS1.C** (HS-PS4-4); **HS.LS1.C** (HS-PS4-4); **HS.PS3.A** (HS-PS4-4),(HS-PS4-5); **HS.PS3.D** (HS-PS4-3),(HS-PS4-4); **HS.ESS1.A** (HS-PS4-3); **HS.ESS2.A** (HS-PS4-1); **HS.ESS2.D** (HS-PS4-3)

*Articulation to DCIs across grade-bands:* **MS.PS3.D** (HS-PS4-4); **MS.PS4.A** (HS-PS4-1),(HS-PS4-2),(HS-PS4-5); **MS.PS4.B** (HS-PS4-1),(HS-PS4-2),(HS-PS4-3),(HS-PS4-4),(HS-PS4-5); **MS.PS4.C** (HS-PS4-2),(HS-PS4-5); **MS.LS1.C** (HS-PS4-4); **MS.ESS2.D** (HS-PS4-4)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. (HS-PS4-2),(HS-PS4-3),(HS-PS4-4) |
| **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. *(HS-PS4-2),(HS-PS4-3),(HS-PS4-4)* |
| **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. *(HS-PS4-1)*,(HS-PS4-4) |
| **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. (HS-PS4-2),(HS-PS4-3),(HS-PS4-4) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-PS4-5)* |
| **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. (HS-PS4-4) |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-PS4-1),(HS-PS4-3) |
| **MP.4** | Model with mathematics. (HS-PS4-1) |
| **HSA-SSE.A.1** | Interpret expressions that represent a quantity in terms of its context. (HS-PS4-1),*(HS-PS4-3)* |
| **HSA-SSE.B.3** | Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. *(HS-PS4-1),(HS-PS4-3)* |
| **HSA.CED.A.4** | Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *(HS-PS4-1),(HS-PS4-3)* |

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
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# HS-LS1 From Molecules to Organisms: Structures and Processes

**HS-LS1 From Molecules to Organisms: Structures and Processes**

Students who demonstrate understanding can:

**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.** [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]

**HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.** [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

**HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.** [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

**HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.** [Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.]

**HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.** [Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.] [Assessment Boundary: Assessment does not include specific biochemical steps.]

**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.** [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.] [Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.]

**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.** [Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.] [Assessment Boundary: Assessment should not include identification of the steps or specific processes involved in cellular respiration.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Developing and Using Models**

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)
- Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7)

**Planning and Carrying Out Investigations**

Planning and carrying out in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)
- Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)

## Disciplinary Core Ideas

**LS1.A: Structure and Function**

- Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)
- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1) *(Note: This Disciplinary Core Idea is also addressed by HS-LS3-1.)*
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)

**LS1.B: Growth and Development of Organisms**

- In multicellular organisms individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism. (HS-LS1-4)

**LS1.C: Organization for Matter and Energy Flow in Organisms**

- The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. (HS-LS1-5)
- The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells. (HS-LS1-6)
- As matter and energy flow through different

## Crosscutting Concepts

**Systems and System Models**

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2), (HS-LS1-4)

**Energy and Matter**

- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6)
- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS1-7)

**Structure and Function**

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

**Stability and Change**

- Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

| | | |
|---|---|---|
| ----------------------------------------------------------<br>*Connections to Nature of Science*<br><br>**Scientific Investigations Use a Variety of Methods**<br>▪ Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings. (HS-LS1-3) | organizational levels of living systems, chemical elements are recombined in different ways to form different products. (HS-LS1-6),(HS-LS1-7)<br>▪ As a result of these chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken and new compounds are formed that can transport energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment. (HS-LS1-7) | |

*Connections to other DCIs in this grade-band:* **HS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **HS.PS2.B** (HS-LS1-7); **HS.LS3.A** (HS-LS1-1); **HS.PS3.B** (HS-LS1-5),(HS-LS1-7)

*Articulation to DCIs across grade-bands:* **MS.PS1.A** (HS-LS1-6); **MS.PS1.B** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.PS3.D** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS1.A** (HS-LS1-1),(HS-LS1-2),(HS-LS1-3),(HS-LS1-4); **MS.LS1.B** (HS-LS1-4); **MS.LS1.C** (HS-LS1-5),(HS-LS1-6),(HS-LS1-7); **MS.LS2.B** (HS-LS1-5),(HS-LS1-7); **MS.ESS2.E** (HS-LS1-6); **MS.LS3.A** (HS-LS1-1),(HS-LS1-4); **MS.LS3.B** (HS-LS1-1)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. (HS-LS1-1),(HS-LS1-6) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1-1),(HS-LS1-6) |
| **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. (HS-LS1-6) |
| **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. (HS-LS1-3) |
| **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. *(HS-LS1-3)* |
| **WHST.9-12.9** | Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS-1-1),(HS-LS1-6) |
| **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. *(HS-LS1-2),(HS-LS1-4),(HS-LS1-5),(HS-LS1-7)* |

*Mathematics –*

| | |
|---|---|
| **MP.4** | Model with mathematics. *(HS-LS1-4)* |
| **HSF-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. *(HS-LS1-4)* |
| **HSF-BF.A.1** | Write a function that describes a relationship between two quantities. *(HS-LS1-4)* |

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas. Integrated and reprinted with permission from the National Academy of Sciences.

  

# HS-LS2 Ecosystems: Interactions, Energy, and Dynamics

**HS-LS2 Ecosystems: Interactions, Energy, and Dynamics**

Students who demonstrate understanding can:

**HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.** [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.] [Assessment Boundary: Assessment does not include deriving mathematical equations to make comparisons.]

**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.** [Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.] [Assessment Boundary: Assessment is limited to provided data.]

**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.** [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.]

**HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.** [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.] [Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow 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.** [Clarification Statement: Examples of models could include simulations and mathematical models.] [Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.]

**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.** [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.]

**HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*** [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]

**HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.** [Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Developing and Using Models**

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show how relationships among variables between systems and their components in the natural and designed worlds.

- Develop a model based on evidence to illustrate the relationships between systems or components of a system. (HS-LS2-5)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical and/or computational representations of phenomena or design solutions to support explanations. (HS-LS2-1)
- Use mathematical representations of phenomena or design solutions to support and revise explanations. (HS-LS2-2)
- Use mathematical representations of phenomena or design solutions to support claims. (HS-LS2-4)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past

## Disciplinary Core Ideas

**LS2.A: Interdependent Relationships in Ecosystems**

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1),(HS-LS2-2)

**LS2.B: Cycles of Matter and Energy Transfer in Ecosystems**

- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)
- Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS2-4)
- Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (HS-LS2-5)

**LS2.C: Ecosystem Dynamics, Functioning, and Resilience**

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6)

## Crosscutting Concepts

**Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS2-8)

**Scale, Proportion, and Quantity**

- The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-LS2-1)
- Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale. (HS-LS2-2)

**Systems and System Models**

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS2-5)

**Energy and Matter**

- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS2-4)
- Energy drives the cycling of matter within and between systems. (HS-LS2-3)

**Stability and Change**

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-LS2-6),(HS-LS2-7)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.



  

and will continue to do so in the future. (HS-LS2-3)
- Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-LS2-7)

**Engaging in Argument from Evidence**

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.
- Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6)
- Evaluate the evidence behind currently accepted explanations to determine the merits of arguments. (HS-LS2-8)

------------------------------------------------------

*Connections to Nature of Science*

**Scientific Knowledge is Open to Revision in Light of New Evidence**
- Most scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence. (HS-LS2-2),(HS-LS2-3)
- Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation. (HS-LS2-6),(HS-LS2-8)

- Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7)

**LS2.D: Social Interactions and Group Behavior**
- Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-LS2-8)

**LS4.D: Biodiversity and Humans**
- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). *(secondary to HS-LS2-7)*
- Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. *(secondary to HS-LS2-7) (Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.)*

**PS3.D: Energy in Chemical Processes**
- The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis. *(secondary to HS-LS2-5)*

**ETS1.B: Developing Possible Solutions**
- When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. *(secondary to HS-LS2-7)*

*Connections to other DCIs in this grade-band:* **HS.PS1.B** (HS-LS2-3),(HS-LS2-5); **HS.PS3.B** (HS-LS2-3),(HS-LS2-4); **HS.PS3.D** (HS-LS2-3),(HS-LS2-4); **HS.ESS2.A** (HS-LS2-3); **HS.ESS2.D** (HS-LS2-5),(HS-LS2-7); **HS.ESS2.E** (HS-LS2-2),(HS-LS2-6),(HS-LS2-7); **HS.ESS3.A** (HS-LS2-2),(HS-LS2-7); **HS.ESS3.C** (HS-LS2-2),(HS-LS2-7); **HS.ESS3.D** (HS-LS2-2)

*Articulation across grade-bands:* **MS.PS1.B** (HS-LS2-3); **MS.PS3.D** (HS-LS2-3),(HS-LS2-4),(HS-LS2-5); **MS.LS1.B** (HS-LS2-8); **MS.LS1.C** (HS-LS2-3),(HS-LS2-4),(HS-LS2-5); **MS.LS2.A** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6); **MS.LS2.B** (HS-LS2-3),(HS-LS2-4),(HS-LS2-5); **MS.LS2.C** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6),(HS-LS2-7); **MS.ESS2.A** (HS-LS2-5); **MS.ESS2.E** (HS-LS2-6); **MS.ESS3.A** (HS-LS2-1); **MS.ESS3.C** (HS-LS2-1),(HS-LS2-2),(HS-LS2-6),(HS-LS2-7); **MS.ESS3.D** (HS-LS2-7)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. (HS-LS2-6),*(HS-LS2-7),(HS-LS2-8)* |
| **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. *(HS-LS2-1),(HS-LS2-2),*(HS-LS2-3),(HS-LS2-6),(HS-LS2-8) |
| **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. *(HS-LS2-6),(HS-LS2-7),(HS-LS2-8)* |
| **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. (HS-LS2-6),(HS-LS2-7),(HS-LS2-8) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-LS2-1),(HS-LS2-2),*(HS-LS2-3) |
| **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. (HS-LS2-3) |
| **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. (HS-LS2-7) |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-6),*(HS-LS2-7)* |
| **MP.4** | Model with mathematics. *(HS-LS2-1),(HS-LS2-2),(HS-LS2-4)* |
| **HSN-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. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),*(HS-LS2-7)* |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. *(HS-LS2-1),(HS-LS2-2),(HS-LS2-4),(HS-LS2-7)* |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-LS2-1),(HS-LS2-2),(HS-LS2-4),*(HS-LS2-7)* |
| **HSS-ID.A.1** | Represent data with plots on the real number line. *(HS-LS2-6)* |
| **HSS-IC.A.1** | Understand statistics as a process for making inferences about population parameters based on a random sample from that population. *(HS-LS2-6)* |
| **HSS-IC.B.6** | Evaluate reports based on data. (HS-LS2-6) |

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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# HS-LS3 Heredity: Inheritance and Variation of Traits

**HS-LS3 Heredity: Inheritance and Variation of Traits**

Students who demonstrate understanding can:

**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.** [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]

**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.** [Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.] [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]

**HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.** [Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.] [Assessment Boundary: Assessment does not include Hardy-Weinberg calculations.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Asking Questions and Defining Problems**

Asking questions and defining problems in 9-12 builds on K-8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

- Ask questions that arise from examining models or a theory to clarify relationships. (HS-LS3-1)

**Analyzing and Interpreting Data**

Analyzing data in 9-12 builds on K-8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS3-3)

**Engaging in Argument from Evidence**

Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence. (HS-LS3-2)

## Disciplinary Core Ideas

**LS1.A: Structure and Function**

- All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins. *(secondary to HS-LS3-1) (Note: This Disciplinary Core Idea is also addressed by HS-LS1-1.)*

**LS3.A: Inheritance of Traits**

- Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. (HS-LS3-1)

**LS3.B: Variation of Traits**

- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. (HS-LS3-2)
- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. (HS-LS3-2),(HS-LS3-3)

## Crosscutting Concepts

**Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS3-1),(HS-LS3-2)

**Scale, Proportion, and Quantity**

- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-LS3-3)

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*Connections to Nature of Science*

**Science is a Human Endeavor**

- Technological advances have influenced the progress of science and science has influenced advances in technology. (HS-LS3-3)
- Science and engineering are influenced by society and society is influenced by science and engineering. (HS-LS3-3)

*Connections to other DCIs in this grade-band:* **HS.LS2.A** (HS-LS3-3); **HS.LS2.C** (HS-LS3-3); **HS.LS4.B** (HS-LS3-3); **HS.LS4.C** (HS-LS3-3)

*Articulation across grade-bands:* **MS.LS2.A** (HS-LS3-3); **MS.LS3.A** (HS-LS3-1),(HS-LS3-2); **MS.LS3.B** (HS-LS3-1),(HS-LS3-2),(HS-LS3-3); **MS.LS4.C** (HS-LS3-3)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. *(HS-LS3-1),(HS-LS3-2)* |
| **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. *(HS-LS3-1)* |
| **WHST.9-12.1** | Write arguments focused on *discipline-specific content.* (HS-LS3-2) |
| *Mathematics –* | |
| **MP.2** | Reason abstractly and quantitatively. (HS-LS3-2),(HS-LS3-3) |

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
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# HS-LS4 Biological Evolution: Unity and Diversity

## HS-LS4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

**HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.** [Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]

**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.** [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.] [Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.]

**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.** [Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.] [Assessment Boundary: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.]

**HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.** [Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading 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.** [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]

**HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.*** [Clarification Statement: Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

### Science and Engineering Practices

**Analyzing and Interpreting Data**
Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS4-3)

**Using Mathematics and Computational Thinking**
Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Create or revise a simulation of a phenomenon, designed device, process, or system. (HS-LS4-6)

**Constructing Explanations and Designing Solutions**
Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS4-2),(HS-LS4-4)

**Engaging in Argument from Evidence**
Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current or historical episodes in science.

- Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS4-5)

**Obtaining, Evaluating, and Communicating Information**
Obtaining, evaluating, and communicating information in 9–12

### Disciplinary Core Ideas

**LS4.A: Evidence of Common Ancestry and Diversity**

- Genetic information provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (HS-LS4-1)

**LS4.B: Natural Selection**

- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2),(HS-LS4-3)
- The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (HS-LS4-3)

**LS4.C: Adaptation**

- Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (HS-LS4-2)
- Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3),(HS-LS4-4)
- Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3)
- Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (HS-LS4-5),(HS-LS4-6)

### Crosscutting Concepts

**Patterns**

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-LS4-1),(HS-LS4-3)

**Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS4-2),(HS-LS4-4),(HS-LS4-5),(HS-LS4-6)

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*Connections to Nature of Science*

**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**

- Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-LS4-1),(HS-LS4-4)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- Communicate scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-LS4-1)

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*Connections to Nature of Science*

**Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**

- A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-LS4-1)

- Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (HS-LS4-5)

**LS4.D: Biodiversity and Humans**

- Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (HS-LS4-6) *(Note: This Disciplinary Core Idea is also addressed by HS-LS2-7.)*

**ETS1.B: Developing Possible Solutions**

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. *(secondary to HS-LS4-6)*
- Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. *(secondary to HS-LS4-6)*

*Connections to other DCIs in this grade-band:* **HS.LS2.A** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); **HS.LS2.D** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); **HS.LS3.A** (HS-LS4-1); **HS.LS3.B** (HS-LS4-1),(HS-LS4-2) (HS-LS4-3),(HS-LS4-5); **HS.ESS1.C** (HS-LS4-1); **HS.ESS2.D** (HS-LS4-6); **HS.ESS2.E** (HS-LS4-2),(HS-LS4-5),(HS-LS4-6); **HS.ESS3.A** (HS-LS4-2),(HS-LS4-5),(HS-LS4-6); **HS.ESS3.C** (HS-LS4-6); **HS.ESS3.D** (HS-LS4-6)

*Articulation across grade-bands:* **MS.LS2.A** (HS-LS4-2),(HS-LS4-3),(HS-LS4-5); **MS.LS2.C** (HS-LS4-5),(HS-LS4-6); **MS.LS3.A** (HS-LS4-1); **MS.LS3.B** (HS-LS4-1),(HS-LS4-2),(HS-LS4-3); **MS.LS4.A** (HS-LS4-1); **MS.LS4.B** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4); **MS.LS4.C** (HS-LS4-2),(HS-LS4-3),(HS-LS4-4),(HS-LS4-5); **MS.ESS1.C** (HS-LS4-1); **MS.ESS3.C** (HS-LS4-5),(HS-LS4-6)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. *(HS-LS4-1)*,(HS-LS4-2),*(HS-LS4-3)*,(HS-LS4-4) |
| **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. (HS-LS4-5) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. *(HS-LS4-1)*,(HS-LS4-2),*(HS-LS4-3)*,(HS-LS4-4) |
| **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. *(HS-LS4-6)* |
| **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. (HS-LS4-6) |
| **WHST.9-12.9** | Draw evidence from informational texts to support analysis, reflection, and research. *(HS-LS4-1)*,(HS-LS4-2),*(HS-LS4-3)*,(HS-LS4-4),(HS-LS4-5) |
| **SL.11-12.4** | Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. *(HS-LS4-1)*,*(HS-LS4-2)* |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. *(HS-LS4-1)*,(HS-LS4-2),(HS-LS4-3),*(HS-LS4-4)*,*(HS-LS4-5)* |
| **MP.4** | Model with mathematics. *(HS-LS4-2)* |

  

# HS-ESS1 Earth's Place in the Universe

**HS-ESS1 Earth's Place in the Universe**

Students who demonstrate understanding can:

**HS-ESS1-1. Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.** [Clarification Statement: Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11-year sunspot cycle, and non-cyclic variations over centuries.] [Assessment Boundary: Assessment does not include details of the atomic and sub-atomic processes involved with the sun's nuclear fusion.]

**HS-ESS1-2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.** [Clarification Statement: Emphasis is on the astronomical evidence of the red shift of light from galaxies as an indication that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the Big Bang, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the Big Bang theory (3/4 hydrogen and 1/4 helium).]

**HS-ESS1-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements.** [Clarification Statement: Emphasis is on the way nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.] [Assessment Boundary: Details of the many different nucleosynthesis pathways for stars of differing masses are not assessed.]

**HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.** [Clarification Statement: Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons.] [Assessment Boundary: Mathematical representations for the gravitational attraction of bodies and Kepler's Laws of orbital motions should not deal with more than two bodies, nor involve calculus.]

**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.** [Clarification Statement: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust increasing with distance away from a central ancient core (a result of past plate interactions).]

**HS-ESS1-6. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.** [Clarification Statement: Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system 4.6 billion years ago. Examples of evidence include the absolute ages of ancient materials (obtained by radiometric dating of meteorites, moon rocks, and Earth's oldest minerals), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Developing and Using Models**

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).

- Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS1-1)

**Using Mathematical and Computational Thinking**

Mathematical and computational thinking in 9–12 builds on K–8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical or computational representations of phenomena to describe explanations. (HS-ESS1-4)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-ESS1-2)
- Apply scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. (HS-ESS1-6)

**Engaging in Argument from Evidence**

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- Evaluate evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-ESS1-5)

**Obtaining, Evaluating, and Communicating Information**

Obtaining, evaluating, and communicating information in 9–12

## Disciplinary Core Ideas

**ESS1.A: The Universe and Its Stars**

- The star called the sun is changing and will burn out over a lifespan of approximately 10 billion years. (HS-ESS1-1)
- The study of stars' light spectra and brightness is used to identify compositional elements of stars, their movements, and their distances from Earth. (HS-ESS1-2),(HS-ESS1-3)
- The Big Bang theory is supported by observations of distant galaxies receding from our own, of the measured composition of stars and non-stellar gases, and of the maps of spectra of the primordial radiation (cosmic microwave background) that still fills the universe. (HS-ESS1-2)
- Other than the hydrogen and helium formed at the time of the Big Bang, nuclear fusion within stars produces all atomic nuclei lighter than and including iron, and the process releases electromagnetic energy. Heavier elements are produced when certain massive stars achieve a supernova stage and explode. (HS-ESS1-2),(HS-ESS1-3)

**ESS1.B: Earth and the Solar System**

- Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. (HS-ESS1-4)

**ESS1.C: The History of Planet Earth**

- Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old. (HS-ESS1-5)
- Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. (HS-ESS1-6)

**ESS2.B: Plate Tectonics and Large-Scale System Interactions**

- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. *(ESS2.B Grade 8 GBE) (secondary to*

## Crosscutting Concepts

**Patterns**

- Empirical evidence is needed to identify patterns. (HS-ESS1-5)

**Scale, Proportion, and Quantity**

- The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-ESS1-1)
- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-ESS1-4)

**Energy and Matter**

- Energy cannot be created or destroyed–only moved between one place and another place, between objects and/or fields, or between systems. (HS-ESS1-2)
- In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. (HS-ESS1-3)

**Stability and Change**

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-ESS1-6)

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*Connections to Engineering, Technology, and Applications of Science*

**Interdependence of Science, Engineering, and Technology**

- Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. (HS-ESS1-2),(HS-ESS1-4)

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*Connections to Nature of Science*

**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.

- Communicate scientific ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-ESS1-3)

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*Connections to Nature of Science*

**Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**

- A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence. (HS-ESS1-2),(HS-ESS1-6)
- Models, mechanisms, and explanations collectively serve as tools in the development of a scientific theory. (HS-ESS1-6)

*HS-ESS1-5)*

**PS1.C: Nuclear Processes**

- Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. *(secondary to HS-ESS1-5),(secondary to HS-ESS1-6)*

**PS3.D: Energy in Chemical Processes and Everyday Life**

- Nuclear Fusion processes in the center of the sun release the energy that ultimately reaches Earth as radiation. *(secondary to HS-ESS1-1)*

**PS4.B Electromagnetic Radiation**

- Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities. *(secondary to HS-ESS1-2)*

- Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-ESS1-2)
- Science assumes the universe is a vast single system in which basic laws are consistent. (HS-ESS1-2)

*Connections to other DCIs in this grade-band:* **HS.PS1.A** (HS-ESS1-2),(HS-ESS1-3); **HS.PS1.C** (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3); **HS.PS2.A** (HS-ESS1-6); **HS.PS2.B** (HS-ESS1-4),(HS-ESS1-6); **HS.PS3.A** (HS-ESS1-1),(HS-ESS1-2); **HS.PS3.B** (HS-ESS1-2),(HS-ESS1-5); **HS.PS4.A** (HS-ESS1-2); **HS.ESS2.A** (HS-ESS1-5)

*Articulation of DCIs across grade-bands:* **MS.PS1.A** (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3); **MS.PS2.A** (HS-ESS1-4); **MS.PS2.B** (HS-ESS1-4),(HS-ESS1-6); **MS.PS4.B** (HS-ESS1-1),(HS-ESS1-2); **MS.ESS1.A** (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3),(HS-ESS1-4); **MS.ESS1.B** (HS-ESS1-4),(HS-ESS1-6); **MS.ESS1.C** (HS-ESS1-5),(HS-ESS1-6); **MS.ESS2.A** (HS-ESS1-1),(HS-ESS1-5),(HS-ESS1-6); **MS.ESS2.B** (HS-ESS1-5),(HS-ESS1-6); **MS.ESS2.D** (HS-ESS1-1)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. *(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-5),(HS-ESS1-6)* |
| **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. (HS-ESS1-5),(HS-ESS1-6) |
| **WHST.9-12.1** | Write arguments focused on *discipline-specific content.* (HS-ESS1-6) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-ESS1-2),*(HS-ESS1-3),(HS-ESS1-5)* |
| **SL.11-12.4** | Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. *(HS-ESS1-3)* |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-3),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6) |
| **MP.4** | Model with mathematics. (HS-ESS1-1),(HS-ESS1-4) |
| **HSN-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. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6) |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS1-1),*(HS-ESS1-2)*,(HS-ESS1-4),*(HS-ESS1-5),(HS-ESS1-6)* |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4),(HS-ESS1-5),(HS-ESS1-6) |
| **HSA-SSE.A.1** | Interpret expressions that represent a quantity in terms of its context. *(HS-ESS1-1),(HS-ESS1-2)*,(HS-ESS1-4) |
| **HSA-CED.A.2** | Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)* |
| **HSA-CED.A.4** | Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *(HS-ESS1-1),(HS-ESS1-2),(HS-ESS1-4)* |
| **HSF-IF.B.5** | Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *(HS-ESS1-6)* |
| **HSS-ID.B.6** | Represent data on two quantitative variables on a scatter plot, and describe how those variables are related. *(HS-ESS1-6)* |

# HS-ESS2 Earth's Systems

## HS-ESS2 Earth's Systems

Students who demonstrate understanding can:

**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.** [Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).] [Assessment Boundary: Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.]

**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.** [Clarification Statement: Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth's surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.]

**HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.** [Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.]

**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.** [Clarification Statement: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.] [Assessment Boundary: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.]

**HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.** [Clarification Statement: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids).]

**HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.** [Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.]

**HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.** [Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples of include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.] [Assessment Boundary: Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

### Science and Engineering Practices

**Developing and Using Models**
Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s).
- Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-6)
- Use a model to provide mechanistic accounts of phenomena. (HS-ESS2-4)

**Planning and Carrying Out Investigations**
Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.
- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-ESS2-5)

**Analyzing and Interpreting Data**
Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.
- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. (HS-ESS2-2)

### Disciplinary Core Ideas

**ESS1.B: Earth and the Solar System**
- Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes. *(secondary to HS-ESS2-4)*

**ESS2.A: Earth Materials and Systems**
- Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (HS-ESS2-1),(HS-ESS2-2)
- Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. (HS-ESS2-3)
- The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (HS-ESS2-4)

**ESS2.B: Plate Tectonics and Large-Scale System Interactions**
- The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (HS-ESS2-3)

### Crosscutting Concepts

**Cause and Effect**
- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-ESS2-4)

**Energy and Matter**
- The total amount of energy and matter in closed systems is conserved. (HS-ESS2-6)
- Energy drives the cycling of matter within and between systems. (HS-ESS2-3)

**Structure and Function**
- The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials. (HS-ESS2-5)

**Stability and Change**
- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-ESS2-7)
- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS2-1)
- Feedback (negative or positive) can stabilize or destabilize a system. (HS-ESS2-2)

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***Connections to Engineering, Technology, and Applications of Science***

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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# HS-ESS2 Earth's Systems

**Engaging in Argument from Evidence**
Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

- Construct an oral and written argument or counter-arguments based on data and evidence. (HS-ESS2-7)

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***Connections to Nature of Science***

**Scientific Knowledge is Based on Empirical Evidence**

- Science knowledge is based on empirical evidence. (HS-ESS2-3)
- Science disciplines share common rules of evidence used to evaluate explanations about natural systems. (HS-ESS2-3)
- Science includes the process of coordinating patterns of evidence with current theory. (HS-ESS2-3)
- Science arguments are strengthened by multiple lines of evidence supporting a single explanation. (HS-ESS2-4)

- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. *(ESS2.B Grade 8 GBE)* (HS-ESS2-1)

**ESS2.C: The Roles of Water in Earth's Surface Processes**

- The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (HS-ESS2-5)

**ESS2.D: Weather and Climate**

- The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (HS-ESS2-2),(HS-ESS2-4)
- Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS2-6),(HS-ESS2-7)
- Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (HS-ESS2-6),(HS-ESS2-4)

**ESS2.E: Biogeology**

- The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it. (HS-ESS2-7)

**PS4.A: Wave Properties**

- Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. *(secondary to HS-ESS2-3)*

**Interdependence of Science, Engineering, and Technology**

- Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. (HS-ESS2-3)

**Influence of Engineering, Technology, and Science on Society and the Natural World**

- New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ESS2-2)

*Connections to other DCIs in this grade-band:* **HS.PS1.A** (HS-ESS2-5),(HS-ESS2-6); **HS.PS1.B** (HS-ESS2-5),(HS-ESS2-6); **HS.PS2.B** (HS-ESS2-1),(HS-ESS2-3); **HS.PS3.A** (HS-ESS2-4); **HS.PS3.B** (HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-5); **HS.PS3.D** (HS-ESS2-3),(HS-ESS2-6); **HS.PS4.B** (HS-ESS2-2); **HS.LS1.C** (HS-ESS2-6); **HS.LS2.A** (HS-ESS2-7); **HS.LS2.B** (HS-ESS2-2),(HS-ESS2-6); **HS.LS2.C** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-7); **HS.LS4.A** (HS-ESS2-7); **HS.LS4.B** (HS-ESS2-7); **HS.LS4.C** (HS-ESS2-7); **HS.LS4.D** (HS-ESS2-2),(HS-ESS2-7); **HS.ESS1.C** (HS-ESS2-4); **HS.ESS3.C** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6); **HS.ESS3.D** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6)

*Articulation of DCIs across grade-bands:* **MS.PS1.A** (HS-ESS2-3),(HS-ESS2-5),(HS-ESS2-6); **MS.PS1.B** (HS-ESS2-3); **MS.PS2.B** (HS-ESS2-1),(HS-ESS2-3); **MS.PS3.A** (HS-ESS2-3),(HS-ESS2-4); **MS.PS3.B** (HS-ESS2-3),(HS-ESS2-4); **MS.PS3.D** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6); **MS.PS4.B** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6); **MS.LS1.C** (HS-ESS2-4); **MS.LS2.A** (HS-ESS2-7); **MS.LS2.B** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6); **MS.LS2.C** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-7); **MS.LS4.A** (HS-ESS2-7); **MS.LS4.B** (HS-ESS2-7); **MS.LS4.C** (HS-ESS2-2),(HS-ESS2-7); **MS.ESS1.C** (HS-ESS2-1),(HS-ESS2-7); **MS.ESS2.A** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6),(HS-ESS2-7); **MS.ESS2.B** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6); **MS.ESS2.C** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6),(HS-ESS2-7); **MS.ESS2.D** (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-5); **MS.ESS3.C** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6),(HS-ESS2-7); **MS.ESS3.D** (HS-ESS2-2),(HS-ESS2-4),(HS-ESS2-6)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. *(HS-ESS2-2),(HS-ESS2-3)* |
| **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. *(HS-ESS2-2)* |
| **WHST.9-12.1** | Write arguments focused on *discipline-specific content.* (HS-ESS2-7) |
| **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. (HS-ESS2-5) |
| **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. *(HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-4)* |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6) |
| **MP.4** | Model with mathematics. (HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6) |
| **HSN-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. (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6) |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS2-1),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-6) |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS2-1),(HS-ESS2-2),(HS-ESS2-3),(HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6) |

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.
The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas. Integrated and reprinted with permission from the National Academy of Sciences.

# HS-ESS3 Earth and Human Activity

**HS-ESS3 Earth and Human Activity**

Students who demonstrate understanding can:

**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.** [Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.]

**HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.*** [Clarification Statement: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen.]

**HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.** [Clarification Statement: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.] [Assessment Boundary: Assessment for computational simulations is limited to using provided multi-parameter programs or constructing simplified spreadsheet calculations.]

**HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*** [Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).]

**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.** [Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.]

**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.** [Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.] [Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

## Science and Engineering Practices

**Analyzing and Interpreting Data**

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

- Analyze data using computational models in order to make valid and reliable scientific claims. (HS-ESS3-5)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Create a computational model or simulation of a phenomenon, designed device, process, or system. (HS-ESS3-3)
- Use a computational representation of phenomena or design solutions to describe and/or support claims and/or explanations. (HS-ESS3-6)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific knowledge, principles, and theories.

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-ESS3-1)
- Design or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ESS3-4)

**Engaging in Argument from Evidence**

Engaging in argument from evidence in 9–12 builds on K–8

## Disciplinary Core Ideas

**ESS2.D: Weather and Climate**

- Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. *(secondary to HS-ESS3-6)*

**ESS3.A: Natural Resources**

- Resource availability has guided the development of human society. (HS-ESS3-1)
- All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2)

**ESS3.B: Natural Hazards**

- Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1)

**ESS3.C: Human Impacts on Earth Systems**

- The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3)
- Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS3-4)

**ESS3.D: Global Climate Change**

- Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (HS-ESS3-5)
- Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (HS-ESS3-6)

**ETS1.B: Developing Possible Solutions**

- When evaluating solutions, it is important to take into

## Crosscutting Concepts

**Cause and Effect**

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-ESS3-1)

**Systems and System Models**

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-ESS3-6)

**Stability and Change**

- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS3-3),(HS-ESS3-5)
- Feedback (negative or positive) can stabilize or destabilize a system. (HS-ESS3-4)

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***Connections to Engineering, Technology, and Applications of Science***

**Influence of Engineering, Technology, and Science on Society and the Natural World**

- Modern civilization depends on major technological systems. (HS-ESS3-1),(HS-ESS3-3)
- Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-ESS3-2),(HS-ESS3-4)
- New technologies can have deep impacts

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

| | | |
|---|---|---|
| experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.<br>▪ Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations). (HS-ESS3-2)<br>------------------------------------------------<br>*Connections to Nature of Science*<br>**Scientific Investigations Use a Variety of Methods**<br>▪ Science investigations use diverse methods and do not always use the same set of procedures to obtain data. (HS-ESS3-5)<br>▪ New technologies advance scientific knowledge. (HS-ESS3-5)<br>**Scientific Knowledge is Based on Empirical Evidence**<br>▪ Science knowledge is based on empirical evidence. (HS-ESS3-5)<br>▪ Science arguments are strengthened by multiple lines of evidence supporting a single explanation. (HS-ESS3-5) | account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. *(secondary to HS-ESS3-2),(secondary HS-ESS3-4)* | on society and the environment, including some that were not anticipated. (HS-ESS3-3)<br>▪ Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ESS3-2)<br>------------------------------------------------<br>*Connections to Nature of Science*<br>**Science is a Human Endeavor**<br>▪ Science is a result of human endeavors, imagination, and creativity. (HS-ESS3-3)<br>**Science Addresses Questions About the Natural and Material World**<br>▪ Science and technology may raise ethical issues for which science, by itself, does not provide answers and solutions. (HS-ESS3-2)<br>▪ Science knowledge indicates what can happen in natural systems—not what should happen. The latter involves ethics, values, and human decisions about the use of knowledge. (HS-ESS3-2)<br>▪ Many decisions are not made using science alone, but rely on social and cultural contexts to resolve issues. (HS-ESS3-2) |

*Connections to other DCIs in this grade-band:* **HS.PS1.B** (HS-ESS3-3); **HS.PS3.B** (HS-ESS3-2),(HS-ESS3-5); **HS.PS3.D** (HS-ESS3-2),(HS-ESS3-5); **HS.LS1.C** (HS-ESS3-5); **HS.LS2.A** (HS-ESS3-2),(HS-ESS3-3); **HS.LS2.B** (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-6); **HS.LS2.C** (HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); **HS.LS4.D** (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); **HS.ESS2.A** (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-6); **HS.ESS2.D** (HS-ESS3-5); **HS.ESS2.E** (HS-ESS3-3)

*Articulation of DCIs across grade-bands:* **MS.PS1.B** (HS-ESS3-3); **MS.PS3.B** (HS-ESS3-5); **MS.PS3.D** (HS-ESS3-2),(HS-ESS3-5); **MS.LS2.A** (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3); **MS.LS2.B** (HS-ESS3-2),(HS-ESS3-3); **MS.LS2.C** (HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); **MS.LS4.C** (HS-ESS3-3); **MS.LS4.D** (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3); **MS.ESS2.A** (HS-ESS3-1),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6); **MS.ESS2.C** (HS-ESS3-6); **MS.ESS2.D** (HS-ESS3-5); **MS.ESS3.A** (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3); **MS.ESS3.B** (HS-ESS3-1),(HS-ESS3-4),(HS-ESS3-5); **MS.ESS3.C** (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6); **MS.ESS3.D** (HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. *(HS-ESS3-1)*,(HS-ESS3-2),(HS-ESS3-4),(HS-ESS3-5) |
| **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. *(HS-ESS3-5)* |
| **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. (HS-ESS3-5) |
| **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. (HS-ESS3-2),(HS-ESS3-4) |
| **WHST.9-12.2** | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-ESS3-1) |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. *(HS-ESS3-1)*,(HS-ESS3-2),(HS-ESS3-3),*(HS-ESS3-4)*,(HS-ESS3-5),(HS-ESS3-6) |
| **MP.4** | Model with mathematics. (HS-ESS3-3),(HS-ESS3-6) |
| **HSN-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. *(HS-ESS3-1)*,(HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6) |
| **HSN-Q.A.2** | Define appropriate quantities for the purpose of descriptive modeling. *(HS-ESS3-1),(HS-ESS3-4),(HS-ESS3-5)*,(HS-ESS3-6) |
| **HSN-Q.A.3** | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. *(HS-ESS3-1),(HS-ESS3-4)*,(HS-ESS3-5),(HS-ESS3-6) |

  

# HS-ETS1 Engineering Design

## HS-ETS1 Engineering Design

Students who demonstrate understanding can:

**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.**

**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.**

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

### Science and Engineering Practices

**Asking Questions and Defining Problems**

Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

- Analyze complex real-world problems by specifying criteria and constraints for successful solutions. (HS-ETS1-1)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical models and/or computer simulations to predict the effects of a design solution on systems and/or the interactions between systems. (HS-ETS1-4)

**Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles and theories.

- Design a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ETS1-2)
- Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ETS1-3)

### Disciplinary Core Ideas

**ETS1.A: Defining and Delimiting Engineering Problems**

- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (HS-ETS1-1)
- Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. (HS-ETS1-1)

**ETS1.B: Developing Possible Solutions**

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (HS-ETS1-3)
- Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (HS-ETS1-4)

**ETS1.C: Optimizing the Design Solution**

- Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (HS-ETS1-2)

### Crosscutting Concepts

**Systems and System Models**

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows— within and between systems at different scales. (HS-ETS1-4)

---

***Connections to Engineering, Technology, and Applications of Science***

**Influence of Science, Engineering, and Technology on Society and the Natural World**

- New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ETS1-1) (HS-ETS1-3)

---

*Connections to HS-ETS1.A: Defining and Delimiting Engineering Problems include:*

**Physical Science:** HS-PS2-3, HS-PS3-3

*Connections to HS-ETS1.B: Designing Solutions to Engineering Problems include:*

**Earth and Space Science:** HS-ESS3-2, HS-ESS3-4, **Life Science:** HS-LS2-7, HS-LS4-6

*Connections to HS-ETS1.C: Optimizing the Design Solution include:*

**Physical Science:** HS-PS1-6, HS-PS2-3

*Articulation of DCIs across grade-bands:* **MS.ETS1.A** (HS-ETS1-1),(HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4); **MS.ETS1.B** (HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4); **MS.ETS1.C** (HS-ETS1-2),(HS-ETS1-4)

*Common Core State Standards Connections:*

*ELA/Literacy –*

| | |
|---|---|
| **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. (HS-ETS1-1),*(HS-ETS1-3)* |
| **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. *(HS-ETS1-1)*,(HS-ETS1-3) |
| **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. (HS-ETS1-1),*(HS-ETS1-3)* |

*Mathematics –*

| | |
|---|---|
| **MP.2** | Reason abstractly and quantitatively. (HS-ETS1-1),*(HS-ETS1-3),(HS-ETS1-4)* |
| **MP.4** | Model with mathematics. (HS-ETS1-1),(HS-ETS1-2),(HS-ETS1-3),(HS-ETS1-4) |


  

## Appendix P: Teaching Credentials

Copies of all ag teacher's credentials are shown below from the California Commission on Teacher Credentialing. Clarissa Rowley's information does not reflect her move in 2014 to Stanislaus County. All teachers possess a clear single subject credential and a clear ag specialist credential.

**Last Name:** CARDOSO
**First Name:** JESSICA
**Middle Name:** LYNNE

**Last Known County of Employment:** STANISLAUS COUNTY OFFICE OF EDUCATION
**Adverse and Commission Actions Indicator:**

Note: Please verify County of Employment is current
If flag displayed, click the Adverse and Commission Actions tab. If no flag, review Status field under the All Documents tab to view any adverse action taken.

Current Document | All Documents | Adverse and Commission Actions

1 - 2 of 2

| | Document Number | Document Title | Term | Status | Issue Date | Expiration Date | Original Issue Date | Grade | Special Grade |
|---|---|---|---|---|---|---|---|---|---|
| > | 140112813 | Specialist Instruction Credential (Agriculture) | Clear | Valid | 8/1/2014 | 6/1/2017 | 7/13/2009 | | |
| > | 120535280 | Single Subject Teaching Credential | Clear | Valid | 5/1/2012 | 6/1/2017 | 7/13/2009 | | |

Authorization/Subjects

1 - 1 of 1

| Authorization Code | Authorization Description | Subject Code | Subject Description | Major/ Minor | Added Authorization Date |
|---|---|---|---|---|---|
| R3A1 | This credential authorizes the holder to teach agriculture in grades twelve and below, including preschool, and in classes organized primarily for adults. It also authorizes the holder to develop and coordinate curriculum, develop programs, and deliver staff development for agriculture education programs coordinated by school districts or county offices of education. | AGRI | Agriculture | MAJ | |

**Last Name:** MONCRIEF
**First Name:** KENNETH
**Middle Name:** STANLEY

**Last Known County of Employment:** STANISLAUS COUNTY OFFICE OF EDUCATION
**Adverse and Commission Actions Indicator:**

Note: Please verify County of Employment is current
If flag displayed, click the Adverse and Commission Actions tab. If no flag, review Status field under the All Documents tab to view any adverse action taken.

Current Document | All Documents | Adverse and Commission Actions

1 - 3 of 3

| | Document Number | Document Title | Term | Status | Issue Date | Expiration Date | Original Issue Date | Grade | Special Grade |
|---|---|---|---|---|---|---|---|---|---|
| > | 130131622 | Specialist Instruction Credential (Agriculture) | Clear | Valid | 3/1/2013 | 3/1/2018 | 2/8/1988 | | |
| > | 130160163 | Single Subject Teaching Credential | Clear | Valid | 3/1/2013 | 3/1/2018 | 2/8/1988 | | |
| > | L02001105 | Certificate of Completion of Staff Development (Registration only/not a CTC document) | | | 3/13/2002 | | | | |

Authorization/Subjects

1 - 1 of 1

| Authorization Code | Authorization Description | Subject Code | Subject Description | Major/ Minor | Added Authorization Date |
|---|---|---|---|---|---|
| R3A1 | This credential authorizes the holder to teach agriculture in grades twelve and below, including preschool, and in classes organized primarily for adults. It also authorizes the holder to develop and coordinate curriculum, develop programs, and deliver staff development for agriculture education programs coordinated by school districts or county offices of education. | AGRI | Agriculture | MAJ | |

**Last Name:** MORTENSEN
**First Name:** BRIAN
**Middle Name:** SCOTT

**Last Known County of Employment:**
**Adverse and Commission Actions Indicator:**

Note: Please verify County of Employment is current
If flag displayed, click the Adverse and Commission Actions tab. If no flag, review Status field under the All Documents tab to view any adverse action taken.

Current Document | All Documents | Adverse and Commission Actions

1 - 3 of 3

| | Document Number | Document Title | Term | Status | Issue Date | Expiration Date | Original Issue Date | Grade | Special Grade |
|---|---|---|---|---|---|---|---|---|---|
| > | 130106123 | Single Subject Teaching Credential | Clear | Valid | 8/1/2013 | 8/1/2018 | 7/1/2003 | | |
| > | 130106122 | Specialist Instruction Credential (Agriculture) | Clear | Valid | 8/1/2013 | 8/1/2018 | 7/1/2003 | | |
| > | 070297851 | Crosscultural, Language and Academic Development Certificate | Clear | Valid | 3/5/2007 | | 3/5/2007 | | |

Authorization/Subjects

1 - 1 of 1

| Authorization Code | Authorization Description | Subject Code | Subject Description | Major/ Minor | Added Authorization Date |
|---|---|---|---|---|---|
| R1S | This document authorizes the holder to teach the subject area(s) listed in grades twelve and below, including preschool, and in classes organized primarily for adults. | AGRI | Agriculture | MAJ | |

**Last Name:** ROWLEY
**First Name:** CLARISSA
**Middle Name:** MARIE

**Last Known County of Employment:** NEVADA COUNTY OFFICE OF EDUCATION
**Adverse and Commission Actions Indicator:**

Note: Please verify County of Employment is current
If flag displayed, click the Adverse and Commission Actions tab. If no flag, review Status field under the All Documents tab to view any adverse action taken.

**Current Document** | All Documents | Adverse and Commission Actions

1 - 3 of 3

| | Document Number | Document Title | Term | Status | Issue Date | Expiration Date | Original Issue Date | Grade | Special Grade |
|---|---|---|---|---|---|---|---|---|---|
| › | 130117816 | Single Subject Teaching Credential | Clear | Valid | 6/15/2013 | 7/1/2018 | 5/31/2011 | | |
| › | 110103836 | Single Subject Teaching Credential | Preliminary | Valid | 5/31/2011 | 6/1/2016 | 5/31/2011 | | |
| › | 110103835 | Specialist Instruction Credential (Agriculture) | Clear | Valid | 5/31/2011 | 6/1/2016 | 5/31/2011 | | |

**Authorization/Subjects**

1 - 2 of 2

| Authorization Code | Authorization Description | Subject Code | Subject Description | Major/ Minor | Added Authorization Date |
|---|---|---|---|---|---|
| ELA1 | The following instructional services may be provided to English learners: (1) instruction for English language development in grades twelve and below, including preschool, and in classes organized primarily for adults. If the prerequisite credential or permit is a designated subjects adult education teaching credential, a child development instructional permit, or a child development supervision permit, English language development instruction is limited to the programs authorized by that credential or permit; (2) specially designed content instruction delivered in English in the subjects, programs and at the grade levels authorized by the prerequisite credential or permit. This English learner authorization also covers classes authorized by other valid, non-emergency credentials or permits held, as specified in Education Code Section 44253.3. | NONE | | | |
| R1S | This document authorizes the holder to teach the subject area(s) listed in grades twelve and below, including preschool, and in classes organized primarily for adults. | AGRI | Agriculture | MAJ | |

**Last Name:** TRAINI
**First Name:** ANTHONY
**Middle Name:** JAMES

**Last Known County of Employment:**
**Adverse and Commission Actions Indicator:**

Note: Please verify County of Employment is current
If flag displayed, click the Adverse and Commission Actions tab. If no flag, review Status field under the All Documents tab to view any adverse action taken.

**Current Document** | All Documents | Adverse and Commission Actions

1 - 2 of 2

| | Document Number | Document Title | Term | Status | Issue Date | Expiration Date | Original Issue Date | Grade | Special Grade |
|---|---|---|---|---|---|---|---|---|---|
| › | 120549588 | Specialist Instruction Credential (Agriculture) | Clear | Valid | 8/1/2012 | 8/1/2017 | 7/10/2003 | | |
| › | 120549589 | Single Subject Teaching Credential | Clear | Valid | 8/1/2012 | 8/1/2017 | 6/1/2002 | | |

**Authorization/Subjects**

1 - 1 of 1

| Authorization Code | Authorization Description | Subject Code | Subject Description | Major/ Minor | Added Authorization Date |
|---|---|---|---|---|---|
| R3A1 | This credential authorizes the holder to teach agriculture in grades twelve and below, including preschool, and in classes organized primarily for adults. It also authorizes the holder to develop and coordinate curriculum, develop programs, and deliver staff development for agriculture education programs coordinated by school districts or county offices of education. | AGRI | Agriculture | MAJ | |

**Appendix Q: Calendar of Activities**

This is a copy of our FFA Activities calendar for 2015-2016. We work as a department and with our officers to develop the activities calendar each summer. The officers then type the calendar for the year into the Program of Activities for the year.

**August**

| | |
|---|---|
| 5 | Stanislaus Farm Supply Farm to Fork Dinner |
| 8 | Farm Supply Picnic |
| 14 | Ice Cream Social |
| 19 | Welcome Back BBQ |
| 29 | Central Region SOLS |
| 28 | Football BBQ @CHS |

**September**

| | |
|---|---|
| 4 | Football BBQ @CHS |
| 9 | FFA Meeting Burrito Bingo |
| 22 | Greenhand Leadership Conference |
| 25 | Football BBQ @ CHS |

**October**

| | |
|---|---|
| 3-4 | Central Region COLC |
| 3-4 | Pumpkin Patch sales |
| 6 | Oakdale Opening & closing Invitational |
| 7 | FFA Meeting @ 3;15 |
| 10-11 | Pumpkin Patch sales |
| 14 | Tri Rivers Opening & Closing |
| 17 | Parli Pro Comp |
| 17-18 | Pumpkin Patch Sales |
| 23 | Football BBQ @ CHS |
| 24-25 | Pumpkin Patch Sales |
| 26-31 | National FFA Convention |
| 28 | FFA Bonfire @ CHS |
| 30 | Football BBQ @ CHS |
| 31 | Pumpkin Patch sale |

**November**

| | |
|---|---|
| 16 | Drive Thru BBQ sales begin |
| 16 | Fruit Tree Sales Begin |
| 17 | Pin Maker and Signature Sheet @ Lunch |
| 18 | FFA Degree Ceremony @ 6:30 |
| 20 | Central Region CATA |
| 20 | UC Davis |

**December**

| | |
|---|---|
| 1 | Sectional Region Activity |

2 FFA Activity (Cookie decorating & contest)
4 ` BBQ forms due
4 Fruit trees forms due
9 Drive thru BBQ 4-6 pm
14 Fruit trees arrive
17 Exec Team Potluck
17 Winter Retreat

**January**
13 FFA Meeting (Minute to Win it )
20 State Degree Scoring @ Gregori
28 Super Thursday @ Pitman

**February**
6 Arbuckle Field Day
6 MJC Parli Pro Invitational
10 Regional Prelims @ Galt
12 Regional speaking Finals
17 Fair Exhibitor & Parent meeting @ 6:30
19-20 MFE/ ALA in Modesto & Regional Officer Interview
21-27 National FFA Week
22 Sport Day LTA: Strongman
23 Staff Breakfast
23 Professional Dress Day: LTA Grass Ski & Dancing
24 Hero Day: Minute to Win it
25 Western Day: LTA: FFA member Lunch
26 CVHS/FFA Spirit Day:LTA: Tractor Pull
27 Central Region CATA/FFA Meeting

**March**
4 UC Davis Parli Pro
5 UC Davis Field Day
12 Chico state field day
16 FFA Meeting Dodge ball @ 3;15
19 Merced Field Day
21 State Degree Ceremony in Turlock
24 Occupational Olympics
26 Modesto Field Day

**April**
1 Regional Parli Pro
6 FFA Bonfire @ 6;30
8 FFA Plant Sale 3-6
9 FFA Plant Sale 8-2
10 FFA Plant sale 8-12
12 Sectional Activity TBD

| | |
|---|---|
| 13 | FFA Meeting Elections @3;15 |
| 23 | Fresno Field Day |
| 23-26 | State FFA Convention |

**May**

| | |
|---|---|
| 7 | State Finals @ Cal Poly  SLO |
| 13 | FFA Banquet @ 6 Pm |
| 18 | American Degree Scoring @ Turlock |
| 20 | Drive Thru BBQ Orders Due |
| 20-22 | Camp Sylvester |
| 21 | Ceres Ag Boosters Dinner Fundraiser |
| 25 | Drive Thru BBQ 4-6 |

**July**

| | |
|---|---|
| 13-23 | Stanislaus County Fair |

## Appendix R: Professional Growth & Development

Below is a copy of our Ag Incentive Grant evidence of professional development and in-service activities for each person in my department. We are involved in both CATA professional development as well as our site and district professional development opportunities.

### INCENTIVE GRANT IN-SERVICE ACTIVITIES DOCUMENTATION

***CRITERIA 4.B*** **School Year** 14-15 **School** **Central Valley High School**

Based on the previous year's record, every agriculture teacher, teaching at least ½ time agriculture, attends a minimum of four of the following professional development activities:

Qualified and Competent Personnel

| ACTIVITIES | TEACHERS NAMES | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Cardoso | Moncrief | Mortensen | Rowley | Traini | | | |
| Fall Region Meeting | x | x | x | x | x | | | |
| Region In-service Day | x | x | x | x | x | | | |
| Spring Region Meeting | x | x | x | x | | | | |
| Section In-service* | x | x | x | x | x | | | |
| Section In-service* | x | x | x | x | x | | | |
| Section In-service* | x | | | | x | | | |
| Section In-service* | x | x | x | x | x | | | |
| Summer Conference | x | x | x | x | x | | | |
| University AgEd Skills Week | x | | x | x | x | | | |
| Professional Development ** | | | | | | | | |

* Four Section In-service Meetings equals one Professional Development Activity

** Can utilize a *maximum* of two other *"Agriculturally Related"* Professional Development activities than those listed above. Explain the Professional Development:

1

2

3

4

5

**Appendix S: R-2 Report**

**Data for Year:** 2014-2015
**School:**
# CA0531 Ceres - Central Valley
Central Valley HS
4033 Central Avenue
PO Box 307
Ceres, CA 95307
Get Map
Web Site
**Teachers:** 5
**Courses Offered:**

| Type | Course | Enrollment | H.S. Grad Credit | UC Credit |
|---|---|---|---|---|
| Ag Biology | Advanced Ag biology | 33 | Life Science | |
| Ag Biology | Ag biology | 21 | Life Science | |
| Ag Biology | Ag biology | 34 | Life Science | |
| Ag Biology | Ag biology | 33 | Life Science | |
| Ag Mechanics | Ag Welding | 30 | Other | |
| Ag Mechanics | Intro to Ag Mechanics | 20 | Other | |
| Ag Mechanics | Intro to Ag Mechanics | 24 | Other | |
| Ag Mechanics | Intro to Ag Mechanics | 34 | Other | |
| Ag Mechanics | Intro to Power Mechanics | 28 | Other | |
| Ag Mechanics | ROP Ag Welding | 16 | Other | |
| Ag Mechanics | ROP Ag Welding | 17 | Other | |
| Animal Science | Animal Science | 14 | Other | |
| Animal Science | Intro to Animal Agriculture | 31 | Other | |
| Animal Science | Intro to Animal Agriculutre | 32 | Other | |
| Animal Science | Introduction to Vet Science | 31 | Other | |
| O.H./Floral | Plant Production | 25 | Other | |
| O.H./Floral | Plant Production | 19 | Other | |
| O.H./Floral | Plant Production | 22 | Other | |
| O.H./Floral | ROP Advanced Floral | 17 | Fine Arts | |

| | | | |
|---|---|---|---|
| O.H./Floral | ROP Intro to Floral | 25 | Fine Arts |
| O.H./Floral | ROP Intro to Floral | 24 | Fine Arts |
| O.H./Floral | ROP Intro to Floral | 24 | Fine Arts |
| Other Ag | Ag Chemistry | 34 | Physical/Earth Sci. |
| Other Ag | Ag Chemistry | 32 | Physical/Earth Sci. |
| Other Ag | Ag Chemistry | 34 | Physical/Earth Sci. |
| | TOTAL | 654 | |
| | Average Class Size | 26.2 | |

## FFA Students by Pathway:

| Pathway | Count |
|---|---|
| Ag Mech. | 99 |
| Agriscience | 132 |
| An. Science | 69 |
| O.H. | 110 |
| | 410 |

## FFA Students by Grade Level:

| Grade Level | Count |
|---|---|
| 9 | 184 |
| 10 | 47 |
| 11 | 78 |
| 12 | 99 |
| 13 | 2 |
| Total | 410 |

## FFA Students by Years in Ag:

| Years in Ag | Count |
|---|---|
| 1 | 304 |
| 2 | 57 |
| 3 | 37 |
| 4 | 11 |
| 5 | 1 |

| | |
|---|---|
| Total | 410 |
| Average Years | 1.4 |

**Freshman Persistence:**

Cohort Year: 2011-2012

| Years in Ag Completed | Count | Percent |
|---|---|---|
| 1 | 134 | 71% |
| 2 | 30 | 16% |
| 3 | 13 | 7% |
| 4 | 11 | 6% |
| Freshman Cohort Students | 188 | |
| Average Years Completed | 1.5 | |

| | |
|---|---|
| Congressional District | 10 |
| Assembly District | 21 |
| State Senate District | 12 |
| County | Stanislaus |
| County-District-School Code | 50710430108076 |

## Central Valley HS
## R2 Student Report
## Year:2015

Gender

| Schnum | ProgName | Male | Female |
|---|---|---|---|
| 466 | Ag Mech. | 100 | 10 |
| 466 | Agriscience | 110 | 106 |
| 466 | An. Science | 22 | 62 |
| 466 | O.H. | 63 | 80 |

Hispanic

| ProgName | Hispanic | Non-Hispanic |
|---|---|---|
| Ag Mech. | 81 | 29 |
| Agriscience | 171 | 45 |
| An. Science | 73 | 11 |
| O.H. | 106 | 37 |

Race*

| ProgName | White | Black | Hispanic | Americian Indian | Asian | Native Hawaiian/Pacifc Island | 2 or more |
|---|---|---|---|---|---|---|---|
| Ag Mech. | 17 | 1 | 0 | 1 | 1 | 0 | 83 |
| Agriscience | 36 | 2 | 0 | 0 | 0 | 2 | 171 |
| An. Science | 7 | 1 | 0 | 0 | 0 | 0 | 75 |
| O.H. | 22 | 2 | 0 | 2 | 2 | 4 | 106 |

Grade Level

| Year In Ag | Grade 9 | Grade10 | Grade11 | Grade12 | Grade13 | Grade14 | Grade15 | Grade16 | Total |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 228 | 29 | 55 | 45 | 0 | 0 | 0 | 0 | 357 |
| 2 | 0 | 74 | 46 | 33 | 0 | 0 | 0 | 0 | 153 |
| 3 | 0 | 0 | 8 | 14 | 0 | 0 | 0 | 0 | 22 |
| 4 | 0 | 0 | 0 | 21 | 0 | 0 | 0 | 0 | 21 |
| Total | 228 | 103 | 109 | 113 | 0 | 0 | 0 | 0 | 553 |
| | | | | | | | | Total 9-12 | 553 |

**Freshman Persistance:**
Cohort Year: 2012-2013

| Years in Ag Completed | Count | Percent |
|---|---|---|
| 1 | 117 | 56% |
| 2 | 52 | 25% |
| 3 | 20 | 10% |
| 4 | 20 | 10% |
| Freshman Cohort Students | 209 | |
| Average Years Completed | 1.7 | |

*Prior to 2010 Hispanic is listed as a race.

## Appendix T: Travel Request

Below is a copy of the travel request that must be completed for all travel reimbursement.

CERES UNIFIED SCHOOL DISTRICT
CONFERENCE EXPENSE FORM

| | | | |
|---|---|---|---|
| REGISTRATION PO # | ______ | CONFERENCE ATTENDED: | ______ |
| EMPLOYEE NAME: | ______ | CONFERENCE DATES: | ______ |
| EMPLOYEE SITE: | ______ | CONFERENCE SITE: | ______ |
| EMPLOYEE SIGNATURE: | ______ | COUNTY: | ______ |

DATE LEFT: ______ TIME LEFT: ______ DATE RETURNED: ______ TIME RETURNED: ______

NOTE: For Pre-Payment, Purchase Order must be in Business Office 15-20 days prior to due date.

| DESCRIPTION | PREPAY | REIMBURSE |
|---|---|---|
| CONFERENCE REGISTRATION FEES<br>(attach registration form for prepay)<br>(attach receipt for reimbursement)...... | $______ | $______ |
| HOUSING<br>(attach registration and housing form for prepay)<br>(attach receipt for reimbursement)...... | $______ | $______ |
| TRAVEL *<br>Travel by private car-reimburse ______ miles @ 57.5¢ per mile..... | | $______ |
| Travel by district car or rental car<br>(attach receipt for gasoline purchase)...... | | $______<br>$______ |
| Travel by air<br>(attach receipts) ______ | | |
| Note:..... Airfare may be arranged by separate purchase order to travel agent | | |

MEALS * PER-DIEM
Six rates depending upon county: (CIRCLE COUNTY)

$66 counties: El Dorado, Los Angeles, Mariposa, Monterey, Nevada, Orange, Riverside, San Diego, San Francisco, Santa Monica, Ventura
$61 counties: Mendocino, Napa, Santa Barbara, Santa Cruz, San Luis Obispo, Contra Costa
$56 counties: Alameda, Fresno, Humbolt, Kings, Mono, Placer, Sacramento, San Mateo, Shasta, Sonoma, Tulare
$51 counties: Madera, Marin, Santa Clara, San Bernardino, San Joaquin
$46 counties: Stanislaus, Yolo, Kern
$41 counties: Inyo, California counties not listed

| | $41 | $46 | $51 | $56 | $61 | $66 | PREPAY | REIMBURSE |
|---|---|---|---|---|---|---|---|---|
| Breakfast # of days___x | 7 | 8 | 9 | 10 | 11 | 12 | $______ | $______ |
| Lunch # of days ___x | 11 | 12 | 13 | 15 | 16 | 18 | $______ | $______ |
| Dinner # of days ___x | 23 | 26 | 29 | 31 | 34 | 36 | $______ | $______ |

Out of State Travel:
Internal Revenue Service guidelines will be used
Contact the Director of Fiscal Services for correct rate.

MISCELLANEOUS EXPENSE
Cab Fare ______
Bridge Toll ______
Parking ______
Other ______

TOTALS ______ $______ $______

*Effective date January 1, 2015

White - Business Office Canary - Business Office Pink - School/Dept.

**Appendix U: CATA Membership Card**

357

CALIFORNIA AGRICULTURAL
TEACHERS' ASSOCIATION

Jessica Cardoso

SERVING AGRICULTURE BY TEACHING
2015/2016 ACTIVE MEMBER

**Appendix V: Five Year Acquisition List**

15-16

- Breed'n Betsy
- Loader/ Ripper for tractor
- Color Printer (agriscience)

Poster Printer (Agriscience)
New Truck
Floor Brake
DiArco Bender
Power Slip Roll
Bar Folder
Cattle Chute and lead up
Cultivation tractor
Walk in refrigerator
Sprayer
Large mower attachment
Work benches
Storage cabinets
Anvils
Bench grinder
Building Swine Unit at Ag Center

16-17
Flatbed trailer
New Van
Pallet jack
Post hole digger
Dehydrators
Convection ovens
Meat grinder
Hot plates
Vacuum sealer

17-18
Building Ruminant Barn at Ag Center
Replace 8 arc welders
Replace 20 engines

18-19

- Replace siding in greenhouse
- Replace benches in greenhouses

19-20

- Free range chicken houses
- Apiary boxes

## Appendix W: Operating Budget for Department

Below are copies of the department budget and spending as of November 2015. The budgeted amounts are included.

2015-2016
Central Valley High School
*General Fund*

End Date 6/30/2015

Balance $576.31

Account Number: AO - 0112

Budgeted amount $0.00 [redacted] $1,507.00

| Date | PO# | Req# | Vendor | Obj | ORG | Description | Enc | Pd |
|---|---|---|---|---|---|---|---|---|
| 7/31/2015 | DO | | Warehouse | 4310 | 112 | Cardoso | $153.71 | |
| 7/31/2015 | DO | | Warehouse | 4310 | 112 | Rowley | $152.03 | |
| 7/31/2015 | DO | | Warehouse | 4310 | 112 | Traini | $131.17 | |
| 7/31/2015 | DO | | Media | 5730 | 112 | Cardoso | $11.10 | |
| 7/31/2015 | DO | | Media | 5730 | 112 | Rowley | 33.7 | |
| 7/31/2015 | DO | | Media | 5730 | 112 | Mortensen | $24.70 | |
| 8/3/2015 | CalCard | | Automotive Wear | 4310 | 112 | Workcoat | $48.13 | |
| 8/10/2015 | Site | | Copy Card | 4310 | 112 | Mortensen | $50.00 | |
| 8/25/2015 | Site | | Copy Card | 4310 | 112 | Cardoso | $50.00 | |
| 8/31/2015 | DO | | Warehouse | 4310 | 112 | Traini | $8.29 | |
| 8/31/2015 | DO | | Warehouse | 4310 | 112 | Cardoso | $2.17 | |
| 8/31/2015 | DO | | Media | 5730 | 112 | Rowley | $94.82 | |
| 8/31/2015 | DO | | Media | 5730 | 112 | Mortensen | $7.20 | |
| 9/1/2015 | 161888 | 1803 | Apperson | 4310 | 112 | Mortensen - scantrons | $163.67 | |

2015-2016
Central Valley High School
(AB Incentive)

End Date 6/30/2015

Account Number: 01-7010-0-XXXX-1110-1000-303-0112

14/15 CO 11,592

Budgeted Amount $32,333.00 [illegible]

| Date | PO# | Req# | Vendor Name | Description | 4310 Inst. Sup Enc | 4310 Pd | 5213 Conference | 5647 Other repairs Enc | 5647 Pd | 5730 Media Enc | 5730 Pd | 5813 | Total Expenses |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Budgeted Amount | | | | | [illegible] | | $0.00 | [illegible] | | [illegible] | | $0.00 | [illegible] |
| 8/31/2015 | DO | | Media | Traini | | | | | | [illegible] | | | [illegible] |
| 8/31/2015 | DO | | Media | Rowley | | | | | | [illegible] | | | [illegible] |
| | | | Encumbered | | $0.00 | | | $0.00 | | [illegible] | | | [illegible] |
| | | | Paid | | | $0.00 | | | $0.00 | | $0.00 | | [illegible] |
| | | | Total Enc/Pd | | | $0.00 | | | $0.00 | | [illegible] | | [illegible] |

2015-2016
Central Valley High School
PERKINS I

End Date 6/30/201

Animal Sci

Account Number: 5402

| | 4310 Inst. Sup | | 5213 Conf Inst | | 5725 | 1181 Subs | | Total |
|---|---|---|---|---|---|---|---|---|
| Budgeted Amount: $6,638.00 | 3,500.00 | | 2,500.00 | | | 638.00 | | $6,638.00 |

| Date | PO# | Req# | Vendor Name/Description | Enc | Pd | Enc | Pd | | Enc | Pd | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | $0.00 |
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| | | | | | | | | | | | $0.00 |
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| | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | $0.00 |

2015-2016
Central Valley High School
PERKINS I

Cru Hoct

End Date 6/30/201

Account Number: 5404

| | | | | 4310 Inst. Sup | | 1000-3000 NonCap-Eq | | 4400 | 5213 Conf Inst | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Budgeted Amount: | $7,095.00 | 3,957.00 | | 638.00 | | 0 | 2,500.00 | | $7,095.00 |
| Date | PO# | Req# | Vendor Name/Description | Enc | Pd | Enc | Pd | | Enc | Pd | |
| | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | $0.00 |
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| | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | $0.00 |
| | Encumbered | | | $0.00 | | $0.00 | $0.00 | | $0.00 | $0.00 | $0.00 |
| | Paid | | | | $0.00 | | $0.00 | | | $0.00 | $0.00 |
| | Total Enc/Pd | | | | $0.00 | | $0.00 | | | $0.00 | $0.00 |
| | Unemcumbered balance | | | | $3,957.0 | | 638.00 | | | 2,500.00 | $7,095.0 |

2015-2016
Central Valley High School
PERKINS
14/15

ag

End Date 6/30/2015

Account Number:

| | | | | | 1000-3000 Sub. Teacher | | 4310 Inst Sup | | 4400 | | 5213 Conf Inst | | 5725 | 6000 Equip | Total Expenses |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5403 | | | | | | | | | | | |
| Budgeted Amount: | | | $14,259.00 | | $1,277.00 | | $8,000.00 | | 0 | | $5,000.00 | | 0 | 0 | $14,277.00 |
| Date | PO# | Req# | Vendor Name | Desc | Enc | Pd | Enc | Pd | Enc | Pd | Enc | Pd | PD | PD | |
| 11/10/2015 | DO | | Subs-pending | SB 69250 1 dy 9/21 FFA Greenhand | $175.00 | | | | | | | | | | $175.00 |
| 9/1/2015 | 161701 | 10926 | Baltzorg | Jon Deere Loader | | | | | | | | | | $8,064.29 | $8,064.29 |
| | | | | | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | | | | | $0.00 |
| | | | | | | | | | | | | | | | $0.00 |
| | | | Totals | | | | | | | | | | | | |
| | | | Encumbered | | $175.00 | | $0.00 | | $0.00 | | $0.00 | $0.00 | $0.00 | | $175.00 |
| | | | Paid | | | $0.00 | | $0.00 | | $0.00 | | $0.00 | | $8,064.29 | $8,064.29 |
| | | | Total Enc/Pd | | | $175.00 | | $0.00 | | $0.00 | | $0.00 | | $8,064.29 | $8,239.29 |
| | | | Unemcumbered balance | | | $1,102.00 | | $8,000.00 | | $0.00 | | $5,000.00 | | ($8,064.29) | $6,037.71 |

**Appendix X: Budget Process**

At Central Valley High School, a culture has long since been established of collaboration between our administration and teachers. There is a steering committee comprised of department heads that brings concerns of teachers to administration as well as serves as a venue to distribute information to all teachers.
Budgets always begin at the summer steering meeting in June where the entire school site budget is examined. All department heads approve the budget before it is sent off to the district level for approval.
After the steering meeting, the agriculture department has their summer department retreat. We discuss our projected budget based on site funding, district CTE LCAP funds, Perkins, and Ag Incentive, and other grant funding sources. Beginning next year, we will be including the Central Region CCPT grant money and CTE Incentive grant money to our discussion. With a large array of funding sources and limitations for uses of each grant, we always work as a team to equitably distribute funds to each class so that every student has maximum opportunities.
The budget process in the next few years will look vastly different than it has the past few years due to the large influx of money. I have never experienced having more money than I could spend. As a department, we want to ensure that this fortunate event is not wasted on useless equipment or lost due to poor planning. We frequently discuss plans for the future funds and have developed pathway budgets with equipment, material, and professional development requests.

Below is a timeline of the budget process for the Central Valley Agriculture Department:

| | |
|---|---|
| June: | Steering budget is approved<br>Department budget is approved |
| August: | Budget is revisited with revisions |
| December: | Begin planning for next school year to make requests to the site budget |
| March 1: | All out of state requisition requests must be placed for current school year's budget |
| April 1: | All in state requisition requests must be placed for current school year's budget |
| May: | Department discussion of budget needs for next school year in preparation for summer steering meeting |

**Appendix Y: Chair Person's Duties & Responsibilities**

I. **Characteristics of a Department Leader**
   a. Instructional Leader
   b. Leadership
      i. Team Player/Leader
      ii. Demonstrated Commitment to our Vision and Mission (4Rs).
      iii. Develops leadership and capacity within department
   c. Student Centered
   d. Knowledgeable
   e. Organized
   f. Willing to help
   g. Supports new staff
   h. Thick Skinned
   i. Problem Solver
   j. Follows Through
   k. Good Listener
   l. Willing to bring issues to the table/Trusting Advocate

II. **Responsible for**
   a. Facilitating Department Meetings
   b. Attending all Steering Meetings
   c. Department Budget Tracking
   d. Delegates Responsibilities
   e. Creates Department Agendas for meetings
   f. Diffuses Problems
   g. Reverse Verification for Master Schedule

III. **Steering Meeting Norms**
   a. On time to Meetings
   b. Stay on Task
   c. Respect Opinions and Needs of all team members and departments
   d. No Hidden Agendas/ "We" vs. "I"
   e. Represent Department Concerns
   f. Good Listener
   g. Participates in Professional Manner
   h. Contributes

## Appendix Z: Chart of Responsibilities

| | Ken | Jessi | Brian | Clarissa | Tony |
|---|---|---|---|---|---|
| Site Budget | X | | | | |
| ROP Budget | X | | | | |
| VEA Budget | X | | | | |
| Ag Incentive | X | | | | |
| FFA Budget | | | | | X |
| **Fair** | | | | | |
| Dairy | | | | | X |
| Beef | | | X | | |
| Ag Mechanics | | | | | X |
| Sheep | | X | | | |
| Swine | | | | X | |
| Rabbits | | | | | X |
| Poultry | X | | | | |
| Ag Hort | X | | | | |
| Horticulture | X | | | | |
| Horse | | X | | | |
| Goat | | X | | | |
| Floriculture | | | X | | |
| Landscapes | | X | | | |
| Power Mech | | | | | X |
| **Judging Teams** | | | | | |
| Floriculture | | | X | | |
| Small Engine | | | | | X |
| Dairy | | | | | X |
| Sectional BIG | | | | X | |
| FBM | | X | | | |
| Parli Pro | | | X | X | |
| Poultry | | | | X | |
| **FFA** | | | | | |
| Officers | | X | | X | |
| FFA President | | | | | |
| FFA Vice President | | | | | |
| FFA Secretary | | | | | |
| FFA Treasure | | | | | |
| FFA Sentinal | | | | | |
| FFA Historian | | | | | |
| FFA Reporter | | | | | |
| Point Award System | | | X | | |
| Chapter Meetings | | X | | X | |
| Officer Meetings | | X | | X | |
| Greenhand Officers | | | | X | |
| Officer Training | | X | | | |
| Ice Cream Social | | | X | | |
| Greenhand BBQ | X | | | | |
| Welcome Back BBQ | | | X | | X |
| Project Competition | | | | | X |
| Faculty Breakfast | X | | | | |
| ALA/MFE | | | | X | X |
| Fair Meeting | | | | | X |
| Impromptu | | | | | X |
| Recruitment | | X | | X | |

| | | | | | |
|---|---|---|---|---|---|
| Prepared Speaking | | X | | | |
| Extemp Speaking | | | | | X |
| COOP Quiz | | | X | | |
| Job Interview | | | | X | |
| Creed Speaking | | | | X | |
| Floral Sales | | | X | | |
| Occupational Oly | X | | X | | X |
| Caroling For Cans | | X | | | |
| Recycling Posters | X | | | | |
| Section Leadership Conf. | | X | | | X |
| State Conference | | | | X | X |
| Football BBQ | X | | | | |
| FFA Banquet | | X | | X | |
| Scholarship | X | | | | |
| Tree Sales | | | | | X |
| Greenhand Conf | | | | X | |
| COLC | | | | | X |
| Section Bowling | | | | | X |
| Section Volleyball | | | | | X |
| Opening/Closing | | X | | | |
| Halloween Fun Fair | | | X | | |
| National Convention | | | | | X |
| Food Court | X | | | | |
| **Plant Sale** | | | | | |
| Ag Mechanics | | | | | X |
| House Plants | | | X | | |
| Vegetables | X | | | | |
| Promotions | | | | X | |
| Students | | X | | | |
| **Department** | | | | | |
| R-2 | | X | | | |
| State Degree | | | X | X | |
| American Degree | | X | | | |
| Proficiency Awards | | X | | | |
| FFA Roster | | X | | | |
| Program of Work | | | X | | |
| Department Plan | | X | | | |
| Advisory Committee | X | | | | |
| **School Farm** | | | | | |
| Swine | | | | X | |
| Sheep | | X | | | |
| Goat | | X | | | |
| Cattle | | | X | | X |
| Greenhouses | X | | | | |
| Veg Crops | X | | | | |
| Hidahl | X | | | | |

**Appendix AA: Substitute Teaching Procedure & Plans**

From the Central Valley Staff Handbook:

**Absences**

When a teacher is ill he/she must report the absence to ASEOP 1-800-942-3767. If needed, please email lesson plans to: Christy Shaw and CVHS Admin.
Each full-time certificated employee is entitled to 10 days of paid sick leave per contract year.
COMP Time
All COMP time is tracked through Principal and Christy Shaw. Accumulated time may be transferred from one employee to another. Employees must decide by June 10 of each year whether to be paid at the rate for in-district subs or carryover their COMP time to the next year.

Teachers cannot have a negative balance on their comp time log sheets at any time. If they do not have time on the books they cannot take comp time off.

Comp cannot be used as “no tell” time. All comp time off must be for a personal necessity reasons (sick, doctors appt. etc). The teacher must have the reason listed before time off is approved.

All comp time sheets must be signed by both the Principal and the teacher at the end of each month.

A teacher can only have 18 periods of comp time on the books at any time. If a teacher has over 18 periods on the books at any time the log must be turned in to Payroll for payment for at least one day (6 periods). No teacher should accrue any further comp time until their balance is brought down to 18 periods or below.

Requests for comp time must be submitted on the blue half sheets available in the Hawks Nest. All requests must be submitted to Christy Shaw no later than 1 week in advance of the scheduled absence. If an emergency should occur, please utilize the Personal Necessity request form in order to request a ½ or full day absence and enter the absence in AESOP.

For personal comp time requests, teachers are responsible for finding their own coverage.

For School Business sub requests: Please submit the purple half sheets (available in the Hawks Nest) to Christy Shaw a week in advance so that she can find coverage.

For more information regarding leaves, please consult the CUTA/CUSD Certificated Employee’s Contract

Below is a copy of the "blue form" required for sub requests for school business related absences.

Central Valley High School
Substitute Request Form

Today's Date:______________________

______________________________________________________________________
Employee Name(s)

Purpose of Release Day/Name of Conference: ____________________________________

Date:______________________________________________________________

Location:____________________________________________________________

Facility requested:________________________Equipment needed:__________________

How many days:__________

Substitute required? ______YES
______NO

Registration cost: (See Polly)

Conference expense? ______YES (Please see Polly for reimbursement procedures)

______NO

Funding source:_______________________________________________________

Department leader approval: ___________________________________________

Principal approval: ___________________________________________________

---

Office use:

Date entered into Digital Schools: ________________ SBA #________________

Budget:________________

Date authorized by district: ______________________

Non-school business absences are entered on AESOP under personal necessity or no-tell. Personal necessity must be approved prior using the following form.

Below is a copy of my sub plans for a recent activity. I include my most important rules, my cell phone number, as well as a detail of what I would like students to accomplish that day. On my desk, I leave copies of the assignments with a key if applicable, and my seating chart/ emergency procedures binder.

# Sub Plans Cardoso 10/27

Thank you for taking my class today. My students know I will be out today. I will be available by cell so please feel free to call if you have questions. [redacted]

Some ground rules:

1. If students ask to use the restroom, they must provide their bathroom pass. They have 4 passes per semester. **No pass= no bathroom.** They must take the pass hanging by the wall near the door. Only one student at a time.
2. Have students remain in their assigned seats, no moving around during class (unless you need to isolate a student). Seats are in the binder.
3. **Please use suspension slip if students are AT ALL non-compliant. I have a zero tolerance policy for disrespect to subs.**
4. All school rules should be applied.

**Remind all classes to read the FFA announcements. 5th period Wilber Arellano will count spirit points. Please tell him to add me to the count.**

### Introduction to Animal Agriculture- periods 1-2

These students will be working on their crossbreed project advertisements. The assignment instructions are on Google Classroom. Students are working in partners and should be with their partner. Anyone not working should be sent out with a pink slip for refusing to work. Don't tolerate any misbehavior.

### Ag Chemistry- periods 4-6

Chem's assignment is on google classroom. They will be completing a Soil WebQuest. Tell them that there is a lot to the assignment and they will have to be very focused to finish today. If they do not finish, IT IS HOMEWORK and MUST BE DONE by TOMORROW.
Please give me an honest account of their behavior, and PLEASE send any student who is a behavior issue to in school so other students are not penalized for a few students' bad choices. Use those pink slips!
Please rate each class period on the back of this paper. Thank you so much, have a great day!
Jessi Cardoso

Period 1 Rating

1 2 3 4 5 6 7 8 9 10

Notes:

Period 2 Rating

1 2 3 4 5 6 7 8 9 10

Notes:

Period 4 Rating

1 2 3 4 5 6 7 8 9 10

Notes:

Period 5 Rating

1 2 3 4 5 6 7 8 9 10

Notes:

Period 6 Rating

1 2 3 4 5 6 7 8 9 10

Notes:

**Appendix BB: Description of Program Completer**

For Central Valley, a program completer is a student that has been enrolled in 3-4 years of agriculture classes. Students that achieve their state degree receive special recognition.

Our largest focus in the coming years with the graduate surveys and improved pathways is to track student completion of pathways. A pathway completer would be a student that has finished 3 years of any individual pathway.

**Appendix CC: Reimbursement Process**

All teachers are reimbursed for expenses incurred for school business. Request for reimbursement must be made before the expense occurs.

At the beginning of the school year, each teacher turns in at least one requisition form for an amount appropriate to their budget for personal purchases for laboratory or classroom activity materials. Typically one teacher or more will also fill out an ASB request for reimbursement for personal purchases of FFA materials. All requests are open POs for a set maximum amount. Teachers must turn in purchase receipts to receive a reimbursement check.

Below are copies of a district funds requisition form and an ASB (FFA) account requisition form.

District Requisition Form

Date:____________200___

CENTRAL VALLEY HIGH SCHOOL
PURCHASE REQUISITION

Vendor:________________________Vendor Number:______________Ship:
_____Best Way
Address__________________________________
_____Will pick up

City________________State_______Zip________

Date wanted:__________

FAX#__________________________________

Check one:
_____Mail P.O. to Vendor

_____Return P.O. to Site

_____Fax P.O.

_____Send attachments

**NOTE: For Conferences- you must include the following:**
WHAT (Event)
WHERE HELD
WHEN (Dates)
WHO (Staff member)
Please itemize registration, housing, meals, etc

| Quantity | Item No. | Description | Unit Cost | Total Cost |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
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| | | | | |
| | | | | |
| | | | | |
| | | | | |

Department: ______________________________ Sub total:____________

Account Code:_____________________________ Tax:_______(SEE POLLY)

Ordered by: ______________________________ Shipping:____________

Approved by: ______________________________ Total:______________
Department Leader

Final approval:_____________________________
Principal Signature

word/officeforms/requisition04

**Central Valley High School**
4033 Central Ave
P.O. Box 307
Ceres, California 95307 0307

| Office Use Only | |
|---|---|
| P.O. # | |
| Check # | |
| Date Paid | |

Date: ____________________

To: ____________________

Vendor Name: ____________________ Vendor # ____________________

Vendor Address: ____________________

____________________

Telephone: ____________________ Fax: ____________________

| Item Number | Description | Quantity | Unit Price | Total Amount |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | Subtotal | |
| | | | 7.375% Tax | |
| | | | Shipping Charges | |
| | | | Total | |

Total may NOT exceed 10% of the approved amount

Requested by: ____________________ (club/sport)

____________________ (advisor/coach)

| For Conferences you must include the following Information: | | |
|---|---|---|
| Conference Title: | | |
| When: | | |
| Staff Member(s) Attending: | | |
| Students Attending (circle one) Yes No | # students attending? | Please itemize registration, housing, meals, sub cost, etc. in the item/description table above |

**Date Needed:** ________

**Check one:**

_____ Mail P.O.

_____ Fax P.O.

_____ Return to Advisor/coach

Verification of Funds: ____________________
Signature of ASB Accountant

Must have ***three*** signatures to be valid:

____________________ Club President/ASB President

____________________ Advisor/Coach

____________________ Activities Director/Athletic Director

***Notice to the vendor:*** *Please mail the invoice attention:* ***ASB Accountant*** *at the address at the top of the purchase order. Please indicate the purchase order number on the invoice.*