FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT

Agriscience Systems Management

Date: November 2015
Proposed Grade Level(s): 11\textsuperscript{th}-12\textsuperscript{th}
Grading: A-F
Subject Area: Science and CTE
Course Length: One Year
Number of Credits: 5 per Semester

Prerequisites: Algebra 1 or Integrated Math 1, passing grade in Ag Bio and Ag Chemistry or
teacher approval

COURSE DESCRIPTION:

This integrated class 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. Throughout the course, students will be graded on participation in intra-curricular FFA activities,
as well as the development and maintenance of an ongoing Supervised Agricultural Experience (SAE)
program.

GENERAL GOALS/ESSENTIAL PURPOSES:

In the first unit, students will practice research skills in agriscience that will give them the skills needed to
correctly complete the unit labs and capstone project. The final unit will culminate in an agriscience
experimental research project. After completing studies in plant science, animal science, natural
resources, and food science, students will develop an agriculture problem to be solved using the scientific
method. Students will utilize the empirical method to design an experiment that will test their own
authentic hypothesis using the skills and processes learned throughout the course that include dissecting
published research and studies, testing the hypothesis, collecting, synthesizing, analyzing and interpreting
data, accepting or rejecting the hypothesis based upon the data, technical reading and writing, and
scientific collaboration.

Students in Unit Two will examine the chemical and biological principles that govern plant science and
crop production, using prior knowledge of plant pathology, taxonomy and biological principles to inform
the unit’s activities. Specifically in this unit, students will examine chemical irradiation methods,
botanical extracts, microbial control, predator use, synthetic pesticides, etc. Through this unit, students
will gather information regarding the risks and benefits of each method in regard to plant production,
agricultural yields, and environmental sustainability.

Unit Three builds on the basic format for research methods developed through activities in Unit One and
Unit Two to help students understand how animals are affected by parasites and other infectious diseases.
Students will review basic livestock anatomy and physiology, livestock production systems, and the goals
and objectives associated with the production of livestock as a food and fiber source. Specifically, students will propose methods for breaking the cycle of parasite and disease resistance by utilizing alternative management options outside of the traditional pharmacological treatments as part of the Parasite and Disease Management Plan (unit culminating activity).

In Unit Four, students will conduct primary research to draw conclusions regarding the impacts of plant and animal systems (units 2 and 3) on natural resources. Students will create model environmental impact reports that include secondary research backing, industry needs, primary research analysis, and sustainability recommendations in watersheds located in agricultural regions. Students will identify local agriculture production areas and their relationships between land characteristics, water quality, and habitat growth and maintenance. Referencing local environments and agriculture practices, students will analyze possible sources of pollution and erosion and determine the impact of animal and plant systems, wildlife interactions, and beneficial and detrimental production practices. Students will use their knowledge to make recommendations on ecological friendly solutions on improving watersheds.

The purpose of Unit Five is to use prior knowledge of chemical and biological principles and apply them to end-stage agricultural practices in food safety and food preservation. Utilizing research skills and technical plant, animal and pest knowledge from earlier units, students will create a consumer-focused and locally-relevant food product (examples: jerky, jam, pickles). They will utilize scientifically proven food safety and preservation methods and will create a comprehensive food safety plan including a food label following FDA guidelines for presentation to be judged by industry professionals. As part of the comprehensive food safety plan students will investigate the importance of implementing Hazardous Analysis Critical Control Point (HACCP) plans in the prevention of foodborne illness.

Throughout all units, students will gather knowledge through laboratory exercises to further develop and enhance their Agriscience Research programs. At the conclusion of the course, students will submit their research in a written paper, and it will include the following components: problem/purpose, background research, hypothesis, methodology, results/data, and discussion/conclusion. Students will create a visual display board, using a digital format that mirrors the use of research posters in higher education, which will also include all of the components of the paper, but in a condensed form. The project and its findings will be shared with the class and the community.

**CCSS READING COMPONENT:**

- **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.
- **RST.11-12.7** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

RST.11-12.1 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.

CCSS WRITING COMPONENT:

WHST.9-12.1 Write arguments focused on discipline-specific content.
WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-12.7 Conduct short, as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject demonstrating understanding of the subject under investigation.
WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

CCSS SPEAKING & LISTENING COMPONENT:

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.

OTHER CCSS COMPONENT:

Mathematics

MP.2 Reason abstractly and quantitatively.
MP.4 Model with mathematics.
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.
HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
HSN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
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.
HSF-BF.A.1 Write a function that describes a relationship between two quantities.
HSS-ID.A.1 Represent data with plots on the real number line.
HSS-IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
HSS-IC.B.6 Evaluate reports based on data.

CTE INDUSTRY SECTOR/PATHWAY/STANDARDS:

CTE Industry Sector: Agriculture and Natural Resources
CTE Agriculture Sector Pathway: Agriscience

Agriculture Foundation Standards:
1.0 – Academics: Students understand the academic content required for entry into postsecondary education and employment in the Agriculture and Natural Resources sector.
2.0 – Communications: Students understand the principles of effective oral, written, and multimedia communication in a variety of formats and contexts.
3.0 – Career Planning and Management: Students understand how to make effective decisions, use career information, and manage personal career plans.
4.0 – Technology: Students know how to use contemporary and emerging technological resources in diverse and changing personal, community, and workplace environments.
5.0 – Problem Solving and Critical Thinking: Students understand how to create alternative solutions by using critical and creative thinking skills, such as logical reasoning, analytical thinking, and problem-solving techniques.
6.0 – Health and Safety: Students understand health and safety policies, procedures, regulations, and practices, including the use of equipment and handling of hazardous materials.
7.0 – Responsibility and Flexibility: Students know the behaviors associated with the demonstration of responsibility and flexibility in personal, workplace, and community settings.
8.0 – Ethics and Legal responsibilities: Students understand professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational norms.
9.0 – Leadership and Teamwork: Students understand effective leadership styles, key concepts of group dynamics, team and individual decision making, the benefits of workforce diversity, and conflict resolution.
10.0 – Technical Knowledge and Skills: Students understand the essential knowledge and skills common to all pathways in the Agriculture and Natural Resources sector.
11.0 – Demonstration and Application: Students demonstrate and apply the concepts contained in the foundation and pathway standards.

Agriscience Pathway Standards:
C1.1-6: Students understand the role of agriculture in the California economy
C2.1-5: Students understand the interrelationship between agriculture and the environment
C3.1-4: Students understand the effects of technology on agriculture
C4.1-5: Students understand the importance of animals, the domestication of animals, and the role of animals in modern society
C5.1-4: Students understand the cell structure and function of plants and animals
C6.1-2: Students understand animal anatomy and systems
C7.1-5: Students understand basic animal genetics
C8.1-3: Students understand fundamental animal nutrition and feeding
C9.1-5: Students understand basic animal health
C10.1-4: Students understand soil science principles
C11.1-6: Students understand plant growth and development
C12.1-3: Students understand fundamental pest management
C13.1-3: Students understand the scientific method

DETAILED UNITS OF INSTRUCTION:

Unit 1: Research Methods in Agriscience


The final unit will culminate in an agriscience experimental research project. Students will identify a problem related to the aspects of agriculture explored in this course (plant science, animal science, natural resources, and food science). After completing studies in plant science, animal science, natural resources, and food science, students will develop an agriculture problem to be solved using the scientific method. Such examples of problems identified by the student may include the effects of estrus synchronization of ovulation, a comparison of the germination rates of GMO and conventional seeds, or an investigation of perceptions of community members towards alternative agriculture practices. The research problem should be current and relevant, and may be applicable on a local, regional, national, or global level. Students will utilize the empirical method to design an experiment that will test their own authentic hypothesis using the skills and processes learned throughout the course that include dissecting published research and studies, testing the hypothesis, collecting, synthesizing, analyzing and interpreting data, accepting or rejecting the hypothesis based upon the data, technical reading and writing, and scientific collaboration.

In this first unit, students will practice research skills in agriscience that will give them the skills needed to successfully complete the unit labs and capstone project.

Unit 2: Plant Systems

Common Core Standards to be addressed: HS-ETS1.1, HS-ETS1.3, RST.11-12.7, SL.11-12.5, WHST.9-12.9

Students will examine the chemical and biological principles that govern plant science and crop production, using prior knowledge of plant pathology, taxonomy and biological principles to inform the unit’s activities. Plant pests are present in all plant systems. Pest populations must be managed to prevent economic losses. Integrated pest management strategies are used to achieve desired results while using cost-effective and environmentally-friendly practices. Students will collect primary and secondary research regarding plant production models, chemical or biological control methods for pest management and agricultural yield expectations. Specifically in this unit, students will examine chemical irradiation methods, botanical extracts, microbial control, predator use, synthetic pesticides, etc. Through this unit, students will gather information regarding the risks and benefits of each method in regard to plant production, agricultural yields and environmental sustainability.
**Unit 3: Animal Systems**

**Common Core Standards to be addressed:** HS-ETS1.2, HS-ETS1.3, RST.11-12.7, RST.11-12.1, WHST.9-12.7, WHST.9-12.9, WHST.9-12.1

Each livestock species has a series of parasites or diseases that can be managed to help produce healthier livestock. This unit builds on the basic format for research methods developed through activities in Unit One and Unit Two to help students understand how animals are affected by parasites and other infectious diseases. Students will review basic livestock anatomy and physiology, livestock production systems, and the goals and objectives associated with the production of livestock as a food and fiber source.

In order to achieve production goals, the management of the livestock herd must include an understanding of how diseases and parasites can impact livestock production in terms of growth efficiency and outcome of an animal. Students will research the basic cycles of the parasites and their prevention and how they are treated. The students will conduct experiments with pathogens, disease and infections related to livestock herds and examine information about the mode of infection and chemistry of the illness as well as the immune response of the species to the parasite or illness. Furthermore, students will propose methods for breaking the cycle of parasite and disease resistance by utilizing alternative management options outside of the traditional pharmacological treatments as part of the Parasite and Disease Management Plan (unit culminating activity).

**Unit 4: Natural Resources**

**Common Core Standards to be addressed:** HS-ETS1.1, HS-ETS1.2, HS-ETS1.3, RST.11-12.1, WHST.9-12.1, WHST.9-12.9, WHST.9-12.7, WHST.11-12.8, WHST.9-12.2

Natural resources can be defined as items found on earth that are of use to humans such as fuel, food, shelter, or a source of wealth. It is what humans do with these resources and the management practices that will determine if these will be available to future generations. In this unit, students will conduct primary research to draw conclusions regarding the impacts of plant and animal systems (units 2 and 3) on natural resources. Students will create model environmental impact reports that include secondary research backing, industry needs, primary research analysis, and sustainability recommendations in watersheds located in agricultural regions. Students will identify local agriculture production areas and their relationships between land characteristics, water quality, and habitat growth and maintenance. Referencing local environments and agriculture practices, students will analyze possible sources of pollution and erosion and determine the impact of animal and plant systems, wildlife interactions, and beneficial and detrimental production practices. Students will use their knowledge to make recommendations on ecological friendly solutions on improving watersheds. Students evaluate the importance of soil and water conservation, the effects of animals, erosion, pollution, and urban sprawl on watersheds, and human impact on the environment and natural resources.

**Unit 5: Food Systems**

**Common Core Standards to be addressed:** SL.11-12.5, WHST.9-12.7, WHST.9-12.9

The purpose of this unit is to use prior knowledge of chemical and biological principles and apply them to end-stage agricultural practices in food safety and food preservation. Utilizing research skills and technical plant, animal and pest knowledge from earlier units, students will create a consumer-focused and locally-relevant food product (examples: jerky, jam, pickles). They will utilize scientifically proven food safety and preservation methods and will create a comprehensive food safety plan including a food
label following FDA guidelines for presentation to be judged by industry professionals. As part of the comprehensive food safety plan students will investigate the importance of implementing Hazardous Analysis Critical Control Point (HACCP) plans in the prevention of foodborne illness. HACCP plans will identify areas of potential contamination in the food chain for a specific product’s production from the raw commodities, preparation, packaging, and through storage by the consumer.

**Final Unit: Agriscience Research Paper and Display**

**Common Core Standards to be addressed:** HS-ETS1.2, RST.11-12.9, RST.11-12.1, WHST.9-12.1, WHST.9-12.5, WHST.9-12.9, SL.11-12.5, HSN-Q.A.3, HSF-IF.C.7, HSS-ID.A.1, HSF-BF.A.1

Throughout all units, students will gather knowledge through laboratory exercises to further develop and enhance their Agriscience Research programs. At the conclusion of the course, students will submit their 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. Students will create a visual display board, using a digital format that mirrors the use of research posters in higher education, which will also include all of the components of the paper, but in a condensed form. The peer group that reviewed the original experimental design will review the final research paper. The project and its findings will be shared with the class in an oral presentation, with the research board on display to aid in communicating the results of the research.

**TEXTBOOK AND RESOURCE MATERIALS:**

**Primary Textbook:**

**Supplemental Materials:**


FDA HACCP [http://www.fda.gov/Food/GuidanceRegulation/HACCP/ucm2006801.htm](http://www.fda.gov/Food/GuidanceRegulation/HACCP/ucm2006801.htm)


Veterinary Medicines for Livestock: [www.gov.uk/managingi-livestock-veterinary-medicines](http://www.gov.uk/managingi-livestock-veterinary-medicines)
COMMON CORE STANDARDS TO BE ADDRESSED:

See standards listed under each unit heading in the Detailed Units of Instruction (Section 7).

DISTRICT ESLRs TO BE ADDRESSED:

Students will be:

- **Self-Directed Learner:** Students will be required to work independently, monitor their progress and meet assignment requirements at stated intervals. This class will prepare students to be self-directed lifelong learners.
- **Effective Communicator:** Students will communicate their understanding of agriculture concepts through written, visual and oral expression.
- **Quality Producer/Performer:** Students will demonstrate successful performance through instructor assessments, completed FFA Record Book, public speaking, and SAE projects.
- **Constructive Thinkers:** Reading and analysis of text provided case studies and opposing points of view will develop students’ problem solving/critical thinking skills.
- **Collaborative Workers:** Students will need to identify and gather resources and information from outside the school and home to complete assignments in class. Students will need to work together to produce laboratory reports and scientific research.
- **Responsible Citizens:** Students will become more knowledgeable of agriculture systems issues along with solutions needed and workplace expectations on a regional and global scale.