FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT

SUSTAINABLE AGRICULTURE BIOLOGY

DATE: MARCH 2015 **SUBJECT AREA: SCIENCE**

PROPOSED GRADE LEVEL(s): 9th-10th **COURSE LENGTH: ONE YEAR**

GRADING: A-F **NUMBER OF CREDITS: 5 per SEMESTER**

PREREQUISITES: PASSING GRADE in AG. EARTH or TEACHER APPROVAL

COURSE DESCRIPTION:

Sustainability is based on a simple principle: Everything that we need for our survival and well-being depends, either directly or indirectly, on our environment. Sustainability creates and maintains the conditions under which humans and the biotic world can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations. Sustainability is important to making sure that we have and will continue to have, the water, materials, and resources to protect human health and our environment.

Sustainable Agriculture 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, does 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.

GENERAL GOALS/ESSENTIAL PURPOSES:

The introductory unit will focus on the biological classifications of agriculture and their associated industry sectors, what sustainability is, and how the scientific method is the driving force behind advancements and developments in sustainable biological practices within agriculture.

While unit one examines whole systems, unit two takes a closer look at components within that system. Students will use evidence gathered from a series of laboratory exercises to be able to describe the transfer of energy from one trophic level to another as well as the cycling of nutrients and energy through ecosystems.

In unit three, students will examine the science of agriculture and evaluate the efficiency and sustainability of current methods. Students will explore the concepts of taxonomy of plants and nomenclature of animals, cell structure, cellular division, DNA, and chromosomes. Students will apply this knowledge to evaluate desirable inheritable traits in each species to artificially select characteristics to breed more efficient and productive offspring as a part of their created breeding plan.

In unit four, students will understand common practices in the agriculture industry that promote sustainability. They will evaluate and/or refine technological solutions that reduce impacts of human activities on natural systems by using practices that utilize cellular biology, genetics, energy cycles, biological systems, plant and animal nomenclature and how these units collectively create ecosystems that were covered in the previous units.

CCSS READING COMPONENT:

Unit 1:

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.

Unit 2:

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.

Unit 3:

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Unit 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.

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:

Unit 2:

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.

Unit 3:

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

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

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:

Unit 2:

SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Unit 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.*)*

DETAILED UNITS OF INSTRUCTION:

Unit of Instruction/Objectives	CCSS Standards	Key Assignments
Unit 1: Agriculture and Agricultural Research Skills **What is sustainable agriculture?** This introductory unit will focus on the biological classifications of agriculture and their associated industry sectors, what sustainability is, and how the scientific method is the driving force behind advancements and developments in sustainable biological practices within agriculture.	MP.2 MP.4 RST.11-12.7 RST.11-12.8 RST.11-12.9	• Categorical Based Mini-Labs • Scientific Method and Sustainability Lab - "Work Like a Scientist"
Unit II: Environment, Energy and Agriculture **How does sustainable agriculture fit into our environment?** While unit one examined whole systems, unit two takes a closer look at components within that system. Students will use evidence gathered from a series of laboratory exercises to be able to describe the transfer of energy from one trophic level to another as well as the cycling of nutrients and energy through ecosystems.	HS-LS1-5 HS-LS1-6 HS-LS1-7 HS-LS2-3 HS-LS2-4 HS-LS2-5 HS-LS2-1 HS-LS2-7 HS-LS4-6 RST.11-12.1 WHST.9-12.2 WHST.9-12.5 WHST.9-12.7 WHST.9-12.9 SL.11-12.5 MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2	• Nitrogen Fixation • Photosynthesis Lab • Transpiration Lab • Sustainable Waste Management • Plant, Grow, Rotate, Repeat Sustainable Crop Management Plan

	HSN-Q.A.3	
Unit III: Molecular Biology and Agriculture **What molecular biology principles guide sustainable agriculture?** In this unit, students will examine the science of agriculture and evaluate the efficiency and sustainability of current methods.	HS-LS1-1 HS-LS1-2 HS-LS1-3 HS-LS1-4 HS-LS3-1 HS-LS3-2 HS-LS3-3 HS-LS4-3 HS-LS4-1 RST.11-12.1 RST.11-12.7 RST.11-12.9 RST.11-12.8 RST.9-10.8 WHST.9-12.1 WHST.9-12.2 WHST.9-12.5 WHST.9-12.7 WHST.9-12.9 MP.2 MP.4 HSF-IF.C.7 HSF-BF.A.1 SL.11-12.5	• **Sustainable Production Plan** • **Biotechnology Use in Agriculture** • **Formal Research Project** Labs and activities have been done in this unit that represent the common applications of biological factors such as genetic potential and variability of plants and animals, the symbiosis of animals and plants within an ecosystem and the impact of new species introduced into an established environment.
Unit IV: Agriculture's relationship with technology and the natural world Driving Question: How do we make decisions to maximize sustainable agricultural practices within a functioning ecosystem?	HSS-ID.A.1 HSS-IC.B.6 HSS-IC.A.1 MP.2 MP.4 RST.11-12.7 RST.11-12.8 RST.11-12.9	• **Practice in Animal Health Management** • **Sustainable Practices in Horticulture** • **Growing Green Communities" - Landscaping** • **Using Nature's Natural Resources** • **Bio prospecting - Discovering Cellulose Microbes for Biofuel Efficiency** • **Sustainable Farming Project**

TEXTBOOK AND RESOURCE MATERIALS:

Primary Textbook:
District Approved Biology Text

Example: Joe Levine and Ken Miller. *Biology*. Prentice Hall, New Jersey. 2008

Secondary Texts:

Herren, Ray V. *The Biological Approach to AgriScience*.4th edition.Delmar Thompson Learning. 2012.New York.

Herren, Ray V. Introduction to *Biotechnology:An Agricultural Revolution*.Delmar Thompson Learning. 2005. New York

Camp, William G. and Thomas B. Daugherty. *Managing our Natural Resources*. Del Mar Publishers. 1998. New York

Baker, MeeCee and Robert Mikesell. *Animal Science: Biology and Technology*. 3rd edition. Delmar Cengage Learning. 2011. New York

Bidlack, James and Shelley Jansky. *Stern's Introduction to Plant Biology*. 12th edition. McGraw Hill Publishing. 2010. New York.

Supplemental Materials:

Burton, Devere L. and Elmer L. Cooper. *Agriscience: Fundamentals and Application*. 3rd edition. Delmar Thompson Learning. 2002. New York.

International Food Information Council. *Biotechnology: A Communications Guide to* Und*erstanding*. 2003 edition. Washington D.C.

Great Lakes Bioenergy Research Center. 2007-2013. Bioprospecting Laboratories https://www.glbrc.org/education/classroom-materials. Wisconsin.

United States Environmental Protection Agency. 2000-2014. What is Sustainability? www. https://ipa.gov/sustainability/basicinfo.html. Washington D.C.

COMMON CORE STANDARDS TO BE ADDRESSED:

*** See middle column titled "CCSS Standards" above under Units of Instruction.**

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 and floral design concepts through written, visual and oral expression.
- **Quality Producer/Performer:** Students will demonstrate successful performance through instructor assessments, completed FFA Record Book, and floral arrangements.
- **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 floral arrangements to meet the consumers needs.
- **Responsible Citizens:** Students will become more knowledgeable of floral design skills needed and workplace expectations on a regional and global scale.

The Folsom Cordova Unified School District prohibits discrimination, intimidation, harassment (including sexual harassment) or bullying based on a person's actual or perceived ancestry, color, disability, race or ethnicity, religion, gender, gender identity or gender expression, immigration status, national origin, sex, sexual orientation, or association with a person or group with one or more of these actual or perceived characteristics. **For concerns/questions or complaints, contact the Title IX Coordinator(s) and Equity Compliance Officer(s): Curtis Wilson, cmwilson@fcusd.org (grades K-5) and Jim Huber, ED. D., jhuber@fcusd.org (grades 6-12), 1965 Birkmont Drive, Rancho Cordova, CA 96742, 916-294-9000 ext.104625**