Converting Agricultural Lesson Plans to be Common Core Compliant for Grades 3-5

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Introduction

- There are few Common Core approved lesson plans for teachers to intermix with traditional science lessons in California.
- The California Ag in the Classroom website has only 13 Common Core approved lesson plans out of the 45 lessons they offer (Learn About Ag, 2017).
- **Purpose:** Create Common Core compliant lessons covering different components of agriculture. The intent is to encourage agricultural education in elementary school classrooms with the goal of increasing agricultural literacy in youth.

To the left is the list of all the California approved lesson plans on the California Agriculture in the Classroom website.

There are few available and even less that are Common Core compliant. These lesson plans shown range from K-12.

Chart and lesson plans are available at: https://learnaboutag.org/resources/table.cfm

Title	Grade	Common Core	Next Generation Science	Science	Mathematics	English Language Arts	History/ Social Science	Health/ Nutrition	Visual/ Performing Arts
A "Sour" Subject	5-6			X	X	X			
A Garden Plot: The Tale of Peter Rabbit	K-1			X		X			
Agricultural Awareness Through Poetry	9-10					X			
Alien Invader Detectives	3-5	X	X						
An Ag Interview	9-10					X	X		
STEM Connections, Energy and Agriculture: Careers in Sustainable Energy	9-12	X	X						
Bon A La Beef	3-12	X							
California Almonds: An Almond Story	3-5	X	X						
California Educator's Guide to Fun With the Plant Nutrient Team	K-3	X	X						
California Walnuts: A Walnut Orchard Through the seasons	2-3	X				X			
California Walnuts: Naturally Nutritious	6-8							X	
California Walnuts: The Importance of Grafting	4-5	X				X			
Chemistry, Fertilizer, and the Environment	8-12	X	X						
Edible Numbers	3-6			X	X			X	X
Edible Plant Parts	2-3	X	X	X	X	X	X	X	X
Food Safety: From Farm to Fork	5-7	X	X						
From "STEM" to Plate: Careers in Food Science	6-8	X	X						X
From Genes to Jeans II	6-12	X	X	X	X	X			
Fruits and Vegetables for Health	4-6	X		X	X	X	X	X	
Milk Matters! Discovering Dairy	4-6			X	X	X	X	X	X
Red Imported Fire Ants	2-3			X	X	X	X		
Science Fair and Lesson Ideas	3-12			X					
Simple and Complex Machines Used in Agriculture	2-5			X	X	X			X
Steer Toward STEM: Careers in Animal Agriculture	3-5	X	X						
That was Then, This is Now	3-6				X	X			
Tomato Trivia	K-3			X	X	X			
Too Much? Too Little?	5-8	X	X						X
WE Garden Lesson Packet	1-6			X	X	X		X	
What Do Plants Need to Grow?	2-4	X	X						
What's Bugging You?	4-6			X	X	X	X		X
Where'd You Get Those Genes?	5-7			X	X	X	X		X

Background

- The mission of Agriculture in the Classroom is to "increase agricultural literacy through K-12 education" (NAITC, 2017).
- Agricultural literacy is to "understand the food and fiber system...includ[ing] its history and its current economic, social and environmental significance to all Americans" (National Research Council, 1988).
- Agricultural literacy is valuable to consumers, can lead to careers in agriculture, and create a greater understanding of the world and of science for students. Agricultural lessons also give students a real life relationship with what they are learning and encourage a higher rate of agricultural literacy in society.

Methodology

- Common Core standards that relate to agriculture education were researched and lessons that correlate with those standards were identified.
- Common Core compliant lesson plans were researched and a template was obtained to use as a guide for the lessons.
- The lesson plans were rewritten in Common Core compliance using the standards and templates previously found.
- The Farm Bureau's program Ag in the Classroom was contacted for guidance and resources to ensure the lesson plans developed meet the Common Core standards as intended.

Results

Lesson 1: Plants Grown in Different Environments

Common Core Aligned Lesson Plan Template

Subject(s): _Science _____ **Grade:** __3rd_____

Teacher(s): _____ **School:** _____

LESSON ELEMENT	STUDENT-FRIENDLY TRANSLATION (# 2,3,4 only)
1. Common Core Learning Standard(s) Addressed: CDE Standards Addressed: 3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted, and a pet dog that is given too much food and little exercise may become overweight.]	
2. Learning Target(s): (What will students know & be able to do as a result of this lesson?) Students will be able to understand how the difference in sun, soil, and water affect the growth of a plant. They will understand how the environment affects the plants.	Today we will be learning about how the environment a plant is in affects how it grows.
3. Relevance/Rationale: (Why are the outcomes of this lesson important in the real world? Why are these outcomes essential for future learning?) What do seeds need to grow? 1.Lead a discussion by starting with 'what do children need to grow?' Then, ask the students what they think plants might need. 2.Sprout a seed in a plastic bag with wet paper towels. A bean seed works great for this. You can also try alfalfa sprouts, or popcorn. Put some seeds in a clear plastic cup with soil. 3.Put some of the seeds in a windowsill to sprout. Put others in a dark corner. Discuss with the children, which of the seeds they think will grow the best. Check and show the children periodically. 4.Have the children estimate how long it will take the seeds to germinate. Chart the growth of the seedlings after they sprout 5.Have the children observe and write on their worksheet what they have observed. 6. Have the students answer review question and infer what plants need to grow.	We will be planting seeds in different locations around the room. We will be observing throughout the week how the plants in the different locations grow differently.
4. Formative Assessment Criteria for Success: (How will you & your students know if they have successfully met the outcomes? What specific criteria will be met in a successful product/ process? What does success on this lesson's outcomes look like?) Plants on the plastic bag in the sun will have a sprout. Plants in the cup in the sun who have been watered should also have sprouted. Plants in the cup in the dark should not have sprouted. And plants in the cup, in the sun that have not been watered should not have a sprout.	We can see that pants in all the locations look different. Let us discuss what plants grew well and what plants did not.

Plant Observation

In the Bag	In the Cup with sun and water.	In the Cup with sun and no water	In the Cup in the dark closet.

Review Questions:

What plants that you observe sprouted?

Why do you think the others did not sprout?

What plant looked the best?

Based on these observations what does a plant need to grow?

Lesson 2: Growing Plants with Hydroponics

Common Core Aligned Lesson Plan Template

Subject(s): ____Growing Plants with Hydroponics_____ **Grade:** ____5th_____

Teacher(s): _____ **School:** _____

LESSON ELEMENT	STUDENT-FRIENDLY TRANSLATION (# 2,3,4 only)
1. Common Core Learning Standard(s) Addressed: ➢ 5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water. [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from soil.]	
2. Learning Target(s): (What will students know & be able to do as a result of this lesson?) ➢ Students will be able to define hydroponics and be able to explain how it works. ➢ Students will be able to list advantages and disadvantages of using a hydroponic system in agriculture. ➢ Students will be able to compare and contrast hydroponically and soil grown plants.	➢ Define and explain what hydroponics is and how it works. ➢ List pros and cons of hydroponics. ➢ Find differences and similarities with hydroponic and soil grown plants.
3. Relevance/Rationale: (Why are the outcomes of this lesson important in the real world? Why are these outcomes essential for future learning?) ➢ This lesson teaches students that plant matter comes mostly from air and water, not soil. It is important because hydroponics is growing in the agriculture industry. It also shows students the benefits of using hydroponics as well as the opportunity to experience plant growth firsthand.	➢ Students see plants being grown without soil. ➢ Gives students a basic understanding of hydroponics and its role in agriculture.
4. Formative Assessment Criteria for Success: (How will you & your students know if they have successfully met the outcomes? What specific criteria will be met in a successful product/process? What does success on this lesson's outcomes look like?) ➢ Students will complete a worksheet that records their observations of the experiment and has them reflect on the results. ➢ The teacher will lead a class discussion to ensure that the students understood the point of the experiment.	➢ Student records observations and answer reflection questions. ➢ Class discussion on observations and results.
5. Activities/Tasks: (What learning experiences will students engage in? How will you use these learning experiences or their student products as formative assessment opportunities?) ➢ Direct Instruction: 1. Ask students what plants need to survive and, after identifying, introduce 'hydroponics' and then have students define it and 'nutrients' in a class discussion. 2. The teacher will read the hydroponics fact sheet with the students and ask questions to check for understanding throughout. ➢ Hydroponics Lab: 3. Plant one of their lettuce plants in a soil container. 4. Students water the plant, measure, sketch it on their worksheet, and continue to monitor its size for two weeks. 5. Next, students shake the soil from the second lettuce plant's roots, have them carefully slide the root section through the straw section of the cup lid. Make the opening bigger if necessary. Once the roots are hanging down, have students fill the cup with water until the level is high enough to reach the roots when the lid is placed on the cup and mix hydroponics solution into the water, then secure the lid on the cup. 6. Students will measure and sketch on worksheet, and continue to monitor its size for two weeks. 7. Place both plants in a window and allow students to predict which plant will grow the most, be the most healthy, and taste the best. 8. Check on daily and record data. After two weeks, draw conclusions. ➢ Students will answer reflection questions on worksheet, then the teacher will lead a class discussion.	
6. Resources/Materials: (What texts, digital resources, & materials will be used in this lesson?) ➢ Copies of the Hydroponics Fact Sheet ➢ Hydroponics Lab Worksheet ➢ Clear plastic cups with lids that attach and contain a hole for the straw, such as those from a restaurant (two for each group) ➢ Small lettuce plants (two for each group) ➢ Soil ➢ Water ➢ Hydroponics nutrients, which can be purchased online or from plant stores	
7. Access for All: (How will you ensure that all students have access to and are able to engage appropriately in this lesson? Consider all aspects of student diversity.) ➢ The teacher will provide all materials necessary for the lesson and will demonstrate how to properly do everything. ➢ Students will be in groups to encourage the students to collaborate and discuss ideas and issues.	
8. Modifications/Accommodations: (What curriculum modifications and/or classroom accommodations will you make for Students with Disabilities in your class? Be as specific as possible.) ➢ The teacher will demonstrate, explain information, and ask questions in more than one way. ➢ The teacher will read aloud anything written or visual. ➢ Keep instructions brief and uncomplicated and allow time for clarification.	

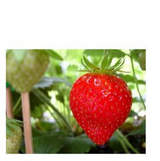
Hydroponics Fact Sheet

What is Hydroponics?

Hydroponics is a method for growing plants without using soil. The **nutrients** that plants need to grow are put into water and then delivered to the roots of the plants. In hydroponics, the water does the work of delivering the nutrients to the plants.

How Can Plants Grow Without Soil?

- Plants need water, sunlight, carbon dioxide, and mineral nutrients to grow.
  - They get water when it rains or you water them.
  - Sunlight is provided from the sky or from special types of artificial lights.
  - Carbon dioxide is in the air we breathe.
  - Mineral nutrients needed by plants are often naturally present in the soil, but they are also in fertilizers.
- The soil itself is not really needed by the plants - just the nutrients in it. So if the nutrients are put in water, the plants can get what they need to grow without the soil.



Strawberries and lettuce can be grown using hydroponics!

Hydroponics is a method of growing plants without soil by getting the **nutrients** they need to them through **water**. Hydroponic farmers have devised many methods for doing this. Hydroponics makes it possible for food to be grown in areas with little soil and rainfall; this method of growing can also produce more crops and grow them more quickly, and has less impact on the environment than traditional farming in soil.

Name:_____

Hydroponics Lab

Day 1 Sketches

Plant in Soil	Hydroponic Plant

Plant in Soil Measurements (in centimeters)

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14

Hydroponic Plant Measurements (in centimeters)

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14

Conclusion & Recommendations

Conclusion

- There are many resources that can aid in converting lessons. Ag in the Classroom provides examples to refer to and people to contact for questions. The Common Core Team for the California Department of Education can answer questions and provide guidance.
- There is no specific way Common Core compliant lessons must be planned as long as objectives meet the Common Core State Standards and the lesson meets the objectives.

Recommendations

- Develop a unit of lessons modeled like the examples found on Ag in the classroom.
- Submit units to be reviewed and published on agclassroom.org and/or learnaboutag.org.

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