SOIL&WATER

CONSERVATION VIRTUAL FIELD TRIP SERIES

DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System | USDA United States Department of Agriculture Natural Resources Conservation Service

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Introduction to Agricultural Sustainability Virtual Field Trip

Grades 9-12 Integrated Biology, Integrated Chemistry, Environmental Science and Agricultural Science

Arkansas NGSS Suggestions:

Integrated Biology:

Topic 6: Life and Earth's Systems

B16-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.

Science and Engineering Practices: Constructing Explanations and Designing Solutions (B16-ETS1-3)

Connections to Engineering, Technology and Applications of Science: Influence of Science, Engineering and Technology on Society and the Natural World. (BI16-ETS1-3)

Disciplinary Core Ideas: ETS1.B: Developing Possible Solutions

Connections to the Arkansas Disciplinary Literacy Standards: RST.11-12.7, 11-12.8, 11-12.9

Connections to the Arkansas Mathematical Standards: MP.2, MP.4

Topic 7: Human Impacts on Earth Systems

BI-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.

Science and Engineering Practices: Constructing Explanations and Designing Solutions (BI-ESS3-1)

Crosscutting Concepts: Cause and Effect (BI-ESS3-1)

Disciplinary Core Ideas: ESS3.A: Natural Resources, ESS3.B: Natural Hazards

Connections to the Arkansas Disciplinary Literacy Standards: RST.11-12.1, WHST.9-12.2

Connections to the Arkansas Mathematical Standards: MP.2, HSN.Q.A.1

BI-ESS3-2: Evaluate competing design solutions for developing, managing and utilizing energy and mineral resources based on cost benefit ratios.

Science and Engineering Practices: Engaging in Argument from Evidence (BI-ESS3-2)

Connections to Engineering, Technology and Applications of Science: Influence of Science, Engineering and Technology on Society and the Natural World (BI-ESS3-2). Science Addresses Questions About the Natural and Material World (BI-ESS3-2)

Disciplinary Core Ideas: ESS3.A: Natural Resources, ETS1.B: Developing Possible Solutions

Connections to the Arkansas Disciplinary Literacy Standards: RST.11-12.1, RST.11-12.8

Connections to the Arkansas Mathematical Standards: MP.2

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

Science and Engineering Practices: Constructing Explanations and Designing Solutions (BI-ESS3-4)

Crosscutting Concepts: Stability and Change (BI-ESS3-4)

Connections to Engineering, Technology and Applications of Science: Influence of Science, Engineering and Technology on Society and the Natural World (BI-ESS3-4)

Disciplinary Core Ideas: ESS3.C: Human Impacts on Earth Systems, ETS1.B: Developing Possible Solutions.

Connections to the Arkansas Disciplinary Literacy Standards: RST.11-12.1, RST.11-12.8

Connections to the Arkansas Mathematical Standards: MP.2, HSN.Q.A.1

B17-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Science and Engineering Practices: Asking Questions and Defining Problems (B17-ETS1-1)

Connections to Engineering, Technology and Applications of Science: Influence of Science, Engineering and Technology on Society and the Natural World (B17-ETS1-1)

Disciplinary Core Ideas: ETS1.A: Defining and Delimiting Engineering Problems

Connections to the Arkansas Disciplinary Literacy Standards: RST.11-12.7-9

Connections to the Arkansas Mathematical Standards: MP.2, MP.4

Integrated Chemistry:

Topic One: Matter and Chemical Reactions:

CI1-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.

Science and Engineering Practices: Constructing Explanations and Designing Solutions (CI1-ETS1-2)

Disciplinary Core Ideas: ETS1.C: Optimizing the Design Solution (CI1-ETS1-2)

Connections to the Arkansas Mathematic Standards: MP.4

Environmental Science:

Topic One: Systems

EVS1-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Science and Engineering Practices: Asking Questions and Defining Problems (EVS1-ETS1-1)

Crosscutting Concepts: Influence of Engineering, Technology and Science on Society and the Natural World (EVS1-ETS1-1)

Disciplinary Core Ideas: ETS1.A: Defining and Delimiting Engineering Problems

Connections to the Arkansas Disciplinary Literacy Standards: RST.11-12.7, RST.11-12.8, RST.11-12.9

Connections to the Arkansas Mathematic Standards: MP.2, MP.4

Topic 2: Energy

EVS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller more manageable problems that could be solved through engineering.

Science and Engineering Practices: Constructing Explanations and Designing Solutions (EVS-ETS1-2)

Disciplinary Core Ideas: ETS1.C: Optimizing the Design Solution

Topic 4: Sustainability

EVS-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.

Science and Engineering Practices: Constructing Explanations and Designing Solutions (EVS-ESS3-1)

Crosscutting Concepts: Cause and Effect (EVS-ESS3-1)

Connections to Engineering, Technology and Applications of Science: Influence of Science, Engineering and Technology on Society and the Natural World (EVS-ESS3-1)

Disciplinary Core Ideas: ESS3.A: Natural Resources. ESS3.B: Natural Hazards

Connections to the Arkansas Disciplinary Literacy Standards: RST.11-12.1, WHST.9-12.2

Connections to the Arkansas Mathematic Standards: MP.2, HSN.Q.A.1,2,3

EVS-ESS3-2: Evaluate competing design solutions for developing, managing and utilizing energy and mineral resources based on cost-benefit ratios.

Science and Engineering Practices: Engage an Argument from Evidence (EVS-ESS3-2)

Crosscutting Concepts: Influence of Science, Engineering and Technology on Society and the Natural World. Science Addresses Questions about the Natural and Material World. (EVS-ESS3-2)

Disciplinary Core Ideas: ESS3.A: Natural Resources, ETS1.B: Developing Possible Solutions (EVS-ESS3-2)

Connections to the Arkansas Disciplinary Literacy Standards: RST.11-12.8

Connections to the Arkansas Mathematic Standards: MP.2

EVS-ESS3-3: Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.

Science and Engineering Practices: Using Mathematics and Computational Thinking (EVS-ESS3-3)

Crosscutting Concepts: Stability and Change (EVS-ESS3-3)

Connections to Engineering, Technology and Applications of Science: Influence of Science, Engineering and Technology on Society and the Natural World (EVS-ESS3-3)

Disciplinary Core Ideas: ESS3.C: Human Impacts on Earth Systems

Connections to the Arkansas Mathematic Standards: MP.2, MP.4

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

Science and Engineering Practices: Constructing Explanations and Designing Solutions (EVS-LS2-7)

Crosscutting Concepts: Stability and Change (EVS-LS2-7)

Disciplinary Core Ideas: LS2.C: Ecosystem Dynamics, Functioning, and Resilience, ESS3.A: Natural Resources, ESS3.C: Human Impacts on Earth Systems, ETS1.B: Developing Possible Solutions

Connections to the Arkansas Disciplinary Literacy Standards: RST.9-10.8, RST.11-12.1, RST.11-12.8, WHST.9-12.7

Connections to the Arkansas Mathematic Standards: MP.2, HSN.Q.A.1, HSN.Q.A.2, HSN.Q.A.3

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

Science and Engineering Practices: Using mathematics and computational thinking (EVS-LS4-6)

Crosscutting Concepts: Cause and Effect (EVS-LS4-6)

Disciplinary Core Ideas: LS4.C Adaptation, LS4.D Biodiversity and Humans

Connections to the Arkansas Disciplinary Literacy Standards: WHST.9-12.5, 9-12.7

Connections to the Arkansas Mathematic Standards: MP.2

EVS4-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.

Science and Engineering Practices: Constructing Explanations and Designing Solutions (EVS-ESS3-4)

Crosscutting Concepts: Cause and Effect (EVS-ESS3-1)

Disciplinary Core Ideas: ESS3.A: Natural Resources

Connections to the Arkansas Disciplinary Literacy Standards: WHST.9-12.5, 9-12.7

Connections to the Arkansas Mathematic Standards: MP.2, MP.4

Objective: Students will understand the importance of agricultural sustainability in regard to the lessening of the environmental impact the loss of nutrients and water have on the local ecosystem. Students will learn that collaboration between farmers and suppliers helps everyone by improving productivity while protecting the local ecosystems.

Assessment: Students will write a reflection paper on what they learned about farmer and supplier collaboration and protection of our ecosystem resources from the Virtual Field Trip video.

Key Points: Sustainability in Agriculture, group collaborations, supply and demand.

Materials:

- You will need to register online if you plan to watch the field trip 'live' on November 17. Once you have registered, you will receive a registration link via Constant Contact. If you do not have a link, email dyoung@uada.edu and one will be emailed to you. If you register during the live feed, you will be automatically directed to the site. You will receive an automated email with the link to the live feed and a reminder email with a link one hour before the VFT begins.
- If you plan to watch the recorded *Introduction to Agricultural Sustainability Virtual Field Trip*, go to www.uaex.uada.edu/soywhatsup and click on the 'Virtual Field Trips and Lessons'

icon on the left-hand side of the page. This will take you to the link for the video. Keep in mind it will take several days for IT to edit and post.

- Paper writing utensils for students (if in class).

Preparation:

If this is being done in class, it is highly recommended that you, the teacher, do research on the key words given below.

Time Duration: one and a half class periods.

The video is about 60 minutes long (45 minutes plus any questions). Assume about 10 minutes for students to look up vocabulary and prepare questions for the video session, 10 minutes to teach essential concepts and about 10 minutes for group discussion and reflection after the video.

Elicit:

Do a KWL Chart about what students know about Agricultural Sustainability. What is sustainability? How does one measure sustainability? What are the advantages of practicing sustainability at all economic levels? How does sustainability concern at the buyer level help farmers? How can farmers practicing sustainability help buyers? Why would retailers be interested in continuous farming sustainability improvement?

Engage:

Tell the students that they are going to watch a video titled '*Introduction to Agricultural Sustainability Virtual Field Trip.'* Before they start the video, have the students break into groups to define the following words:

- Sustainability
- Wholesale suppliers and supply chain
- Continuous Improvements (Agricultural)
- Retailers

Once all the words are defined, have each group come up with two questions they have about the above word groups that may be answered in the video. ***Their jobs are to turn in the questions and the answers by the end of the virtual field trip. ****

*The live video stream will give your students an opportunity to ask questions throughout the field trip. If they are not finding their questions adequately answered during the broadcast, you can send in their questions to be answered at the end of the video.

Explain:

BEFORE THE VIDEO, be sure the students understand that agricultural sustainability not only benefits the environment, but the farmer and buyers too. Many farmers are aware that water and nutrient conservation can translate into more profits for them. Big businesses take advantage of this by advertising to consumers their choice to go with products from sustainable farms.

Biology Teachers: This is a good time to cover/review human impact on ecological systems and how population dynamics/agriculture affect the local ecology and economics.

Chemistry Teachers: Cover how today's technology is preserving water and nutrients in our ecosystems.

Environmental Science Teachers: This is a good time to cover/review human impact on ecological systems and how population dynamics/agriculture affect the local ecology and economics.

AG Teachers: This is a good time to cover/review human impact on ecological systems and how population dynamics/agriculture affect the local ecology, and the economics of farming profitability by using continuous agricultural improvement.

Explore:

Farmers have to be constantly aware of the resources they use to grow their crops. Practicing sustainability in the field means less water and chemicals (herbicide and insecticide) treatments. This translates into more profit for the farmer and is environmentally friendly. Many farmers are aware that by continuously improving agricultural sustainability on their farms, they can appeal to big businesses who are interested in marketing products that come from ecological friendly farms.

Show the video '*Introducing Agricultural Sustainability Virtual Field Trip.*'

Elaborate:

After the video, break the students into three groups; the *Retailer* group, the *Wholesaler* group, and the *Farmer* group. Have each group brainstorm their area of study and explain to the class how important their area is to sustainability and conservation. Tell students they need to come up with at least six ways total and then report them to the rest of the class.

Evaluate:

Students will turn in a two-paragraph reflection paper on what they learned and how these sustainability efforts can affect where they live. They also need to give the answers to their two questions from the video.

Extend:

End the lesson with how the conservation practices of farmers to decrease their dependence on water and chemicals has also had a huge impact on our personal lives through the water we use and the food we eat. Reiterate how consumers concern for sustainable ecological friendly products can, in turn, drive how farmers and the supply chain approach production.

Assign a brainstorming project that allows students to design their own alternate growing methods or have students research sustainability practices and how they could benefit local farmers.

Have an agent from a local company or a local extension agent come to the classroom to explain how farmers and their people can and do collaborate.