

AGRICULTURE AND RESOURCES DEVELOPMENT I CURRICULUM

Unit 1: Agriculture and the FFA Organization

OVERVIEW

Summary

Introduction to Agriculture I will be the first course students enrolled in the Agriculture CTC program will take. Additionally, it is a science elective that is available to the general student population. During Unit 1, students will be introduced to the concept of agriculture and many related fields. They will examine the history of agriculture in the United States as well as an overview of modern agriculture (this will be addressed in more detail in another unit). This will be done through the lense of an introduction to the National FFA Organization (formerly the Future Farmers of America). Students will register with FFA.org and explore the multitude of resources available to them. Additionally, students will be expected to familiarize themselves with basic FFA knowledge. This includes but is not limited to the FFA Motto, the FFA Creed, FFA historical information, and levels of membership.

Content to Be Learned

- Concept of agriculture and related fields and jobs.
- History of agriculture inventions, innovations and discoveries in the United States.
- History of The FFA Organization.
- FFA Motto and Creed.
- Structure of the FFA Organization.

Practices

- Constructing and revising an explanation describing historically important agricultural inventions and/or discoveries and their impact on modern agriculture.
- Obtaining, evaluating, and communicating information regarding the National FFA Organization, the resources it offers to students, and the various awards available to its members.

Crosscutting Concepts

- Cause and effect.
- Influence of science, engineering and technology on society and the natural world.

Essential Questions

- Since 1928, the National FFA Organization has provided students with unequalled preparation for careers in the field of agriculture. How can individual students at Chariho High School better prepare

themselves for a successful career and life with the FFA?

Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Standards

- CS.01.01. Performance Indicator: Action: Exhibit the skills and competencies needed to achieve a desired result.
 - CS.01.01.01.a. Work productively with a group or independently.
 - CS.01.01.01.b. Demonstrate the ability to complete a task without assistance.
- CS.01.03. Performance Indicator: Vision: Establish a clear image of what the future should look like.
 - CS.01.03.03.a. Analyze the risks and rewards of new experiences.
- CS.02.03. Performance Indicator: Professional Growth: Develop awareness and apply skills necessary for achieving career success.
 - CS.02.03.01.a. Explore various career interests/options.
 - CS.02.03.01.b. Make decisions to plan for a personal career.
 - CS.02.03.03.a. Identify the skills required for various careers.
 - CS.02.03.03.b. Develop skills required for a specific career.

Unit 2: Agricultural Careers and Job Safety

OVERVIEW

Summary

During Unit 2, students will examine a variety of agriculture careers and be able to describe the education and practical experience required for each. Students will reach out to individuals in those careers to determine the reality of agriculture careers. Additionally, students will begin to develop an SAE (supervised agricultural experience) project that is relevant to their interests, jobs, and/or life goals. This will be a semester and/or year long project (depending on Ag CTC program status) that will allow students to study a career or component of agriculture in an in-depth manner. In terms of safety, students will work in groups or independently to learn of the safety risks in agriculture. Students in the Ag CTC program will complete the OSHA 10 hour safety training course as a mandatory part of the program. General population students will be offered the opportunity to take the course.

Content to Be Learned

- The expectations of a SAE (supervised agricultural experience).
- The documentation required for the SAE.
- Purpose of Occupational Safety and Health Administration (completion of OSHA 10 hour safety course for Ag CTC students, offered to general population students if they pay their own way).
- Hazards associated with the outdoor environment, animals, and agricultural jobs sites.
- Safety procedures for working outdoors, with animals, and on agricultural jobs sites.

Practices

- Asking questions about what aspects of agriculture interest the individual student to determine the type of SAE they will be developing.
- Planning and carrying out an investigation as part of the students SAE on the agricultural topic of their choosing.
- Obtaining, evaluating, and communicating information regarding the chosen SAE (on-going during the course of the semester or year depending on Ag CTC status).
- Constructing an explanation to describe why there are so many safety regulations in place for agriculture careers and how they were developed.

Crosscutting Concepts

- Cause and effect.

Essential Questions

- How have years of experience and data allowed OSHA to create safety recommendations for the safety of all workers?

AFNR Career Cluster Content Standards

- CS.01.01. Performance Indicator: Action: Exhibit the skills and competencies needed to achieve a desired result.
 - CS.01.01.04.a. Explore available resources to assist in meeting project needs.
 - CS.01.01.04.b. Use appropriate and reliable resources to complete an action or project.
- AS.06.01. Performance Indicator: Demonstrate safe animal handling and management techniques.
 - AS.06.01.01.a. Discuss the dangers involved in working with animals. AS.06.01.01.b. Outline safety procedures for working with animals by species.
- NRS.02.01. Performance Indicator: Develop a safety plan for work with natural resources.
 - NRS.02.01.01.a. Identify hazards associated with the outdoor environment.
 - NRS.02.01.01.b. Demonstrate safety practices when working in an outdoor environment.
 - NRS.02.01.02.a. Recognize biohazards associated with natural resources.
 - NRS.02.01.02.b. Use appropriate techniques and equipment when working with biohazards.

Unit 3: Modern Agriculture

OVERVIEW

Summary

In this unit, students will research and describe modern agriculture and the wide type of production practices employed by American farmers. Throughout the semester when techniques are applicable, students will put them into practice in the classroom. Additionally, students will be able to use industry jargon appropriately and differentiate between terms and related management practices (ex: organic vs. all natural, free range vs. cage free). Students will also explore the idea of sustainable agriculture in a variety of fields. Additionally, students will examine the role of technology in many aspects of agriculture in the United States.

Content to Be Learned

- Concept of agricultural biotechnology.
- The role of agricultural biotechnology in plant science and natural resource science.
- The concept of sustainable agriculture and its implications.
- Common animal and plant production terms that describe how the product was produced (including but not limited to natural, organic, free-range, cage free, etc).
- Current technological applications in the field of agriculture.

Practices

- Obtaining, evaluating, and communicating information regarding common production terms and the management practices associated with them.
- Communicating scientific information regarding current applications of technology in the field of agriculture.
- Engaging in argument from evidence to persuade an audience regarding sustainable agriculture - is it the wave of the future or just a fad?

Crosscutting Concepts

- Cause and effect.
- Stability and change.

Essential Questions

- In an increasingly technological world, how can agricultural producers utilize technology to improve production of such low tech products as food?

AFNR Career Cluster Content Standards

- AS.04.02. Performance Indicator: Prescribe and administer animal feed additives and growth promotants in animal production.
 - AS.04.02.01.a. Explain the purpose and benefits of feed additives and growth promotants in animal production
- AS.08.01. Performance Indicator: Reduce the effects of animal production on the environment.
 - AS.08.01.01.a. Evaluate the effects of animal agriculture on the environment.
 - AS.08.01.01.b. Outline methods of reducing the effects of animal agriculture on the environment.
- BS.01.01. Performance Indicator: Distinguish major innovators, historical developments and potential applications of biotechnology in agriculture.
 - BS.01.01.01.a. Define biotechnology and explore the historical impact it has had on agriculture.
 - BS.01.01.02.a. Investigate current applications of biotechnology in agriculture.
 - BS.01.01.03.a. Examine potential future applications of biotechnology in agriculture and compare them with alternative approaches to improving agriculture.
- PS.03.01. Performance Indicator: Demonstrate plant propagation techniques.
 - PS.03.01.02.a. Demonstrate sowing techniques and provide favorable conditions for seed germination.
 - PS.03.01.03.a. Describe optimal conditions for asexual propagation and demonstrate techniques used to propagate plants by cuttings, division, separation and layering.
 - PS.03.01.03.c. Evaluate asexual propagation practices based on productivity and efficiency.

- PS.03.01.05.a. Explain the principles behind recombinant DNA technology and the basic steps in the process.
- PS.03.01.05.b. Give examples of the risks and advantages associated with genetically modified plants.
- PS.03.03. Performance Indicator: Develop and implement a plan for integrated pest management.
 - PS.03.03.02.a. Describe damage caused by plant pests and diseases.
 - PS.03.03.03.a. Describe pest control strategies associated with integrated pest management.
 - PS.03.03.04.a. Explain risks and benefits associated with the materials and methods used in plant pest management.
- PS.03.04. Performance Indicator: Apply principles and practices of sustainable agriculture to plant production.
 - PS.03.04.01.a. Explain sustainable agriculture and objectives associated with the strategy.
 - PS.03.04.01.b. Describe sustainable agriculture practices and compare the ecological effects of traditional agricultural practices with those of sustainable agriculture.
- PS.03.05. Performance Indicator: Harvest, handle and store crops.
 - PS.03.05.01.a. Identify harvesting methods and harvesting equipment.

Unit 4: Natural Resources

OVERVIEW

Summary

In Unit 4, students will learn about the different types of natural resources in the United States. They will examine how past actions have impacted the availability of these resources in modern times. Within this exploration, the students will be able to apply the terms exploitation, conservation, and preservation as they relate to natural resources. The unit will wrap up with discussion of how the different types of resources (non-exhaustible, renewable and exhaustible) can be managed moving forward so generations of agriculturalists will still be able to utilize them.

Content to Be Learned

- The concept of natural resources.
- Major categories of natural resources in America.
- Concepts of exploitation, conservation and preservation as they relate to natural resource management.
- The history of conservation in the United States.
- Concepts of non-exhaustible, renewable, and exhaustible natural resources.

Practices

- Analyzing and interpreting data to examine how natural resources are used in the United States.
- Constructing an explanation that shows knowledge of historical activities that affected natural resources in the United States.
- Asking questions about what can be done in the future to conserve and preserve natural resources.
- Constructing an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

Crosscutting Concepts

- System and system models.
- Cause and effect.

Essential Questions

- How can the knowledge of past misuse of natural resources be used to develop a plan for sustainable natural resource use in the future?

AFNR Career Cluster Content Standards

- NRS.01. Performance Element: Explain interrelationships between natural resources and humans necessary to conduct management activities in natural environments.
 - NRS.01.01.01.a. Identify natural resources.
 - NRS.01.01.01.b. Differentiate between renewable and nonrenewable natural resources.

Next Generation Science Standards

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.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Constructing Explanations and Designing Solutions</p> <p>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.</p> <ul style="list-style-type: none"> • 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. 	<p>ESS3.A: Natural Resources</p> <ul style="list-style-type: none"> • Resource availability has guided the development of human society. <p>ESS3.B: Natural Hazards</p> <ul style="list-style-type: none"> • 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. 	<p>Cause and Effect</p> <ul style="list-style-type: none"> • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. <hr style="border-top: 1px dashed #ccc;"/> <p>Connections to Engineering, Technology, and Applications of Science</p> <p>Influence of Science, Engineering, and Technology on Society and the Natural World</p> <ul style="list-style-type: none"> • Modern civilization depends on major technological systems.

Connections to other DCIs in this grade-band: N/A

Articulation of DCIs across grade-bands:

MS.LS2.A ; MS.LS4.D ; MS.ESS2.A ; MS.ESS3.A ; MS.ESS3.B

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)

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)

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)

HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS3-1)

HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS3-1)

* The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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Unit 5: Soil and Water Science

OVERVIEW

Summary

Within this unit, students will examine the importance of soil and water science in agriculture. Students will begin by describing how soil is formed and eroded. Then students will describe the physical and chemical characteristics of soil. Additionally, students will conduct soil tests to determine how the physical characteristics of soil influence in filtration and percolation of water. This will be a segue into the hydrologic cycle. Students will begin with a general introduction to the hydrologic cycle and how it can be manipulated by humans to benefit agriculture. They will also examine how pollution moves through the hydrologic cycle.

Content to Be Learned

- The process involved in soil formation.
- A mature soil profile.
- Eight land capability classes.
- Soil series and explain how it differs from land capability classes.
- Natural soil erosion and how it differs from soil erosion caused by humans.
- Major types of soil erosion.
- The components of the hydrologic cycle.
- The categories of main water users.
- Three major water pollution groups.
- Major agricultural pollutants.
- Common water pollution control measures.

Practices

- Using models to demonstrate how water pollution can be detrimental to the environment.
- Obtaining, evaluating, and communicating information that describes how water and soil are both essential to agriculture but can also be damaged by it.
- Constructing an explanation that demonstrates knowledge of common water and soil management practices that are sustainable.

Crosscutting Concepts

- Systems and system models.
- Cause and effect.

Essential Questions

- How is it possible to both be harmful to natural resources, but at the same time need them?
- How can humans modify use of natural resources to ensure they are available for use in the future?

AFNR Career Cluster Content Standards

- NRS.01.02. Performance Indicator: Classify natural resources.
 - NRS.01.02.05.a. Demonstrate techniques used to identify rock, mineral and soil types.
 - NRS.01.02.05.b. Identify rock, mineral and soil types.
- ESS.03.02. Performance Indicator: Apply soil science principles to environmental service systems.

- ESS.03.02.01.a. Explain the process of soil formation through weathering.
- ESS.03.02.02.a. Describe the biodiversity found in soil and the contribution of biodiversity to the physical and chemical characteristics of soil.
- ESS.03.02.03.a. Explain how the physical qualities of the soil influence the infiltration and percolation of water.
- ESS.03.02.03.b. Identify the physical qualities of the soil that determine its use for environmental service systems.
- ESS.03.02.03.c. Conduct tests of soil to determine its use for environmental service systems.
- ESS.03.02.04.a. Identify land uses, capability factors and land capability classes.
- ESS.03.02.04.b. Use a soil survey to determine the land capability classes for different parcels of land in an area.
- ESS.03.03. Performance Indicator: Apply hydrology principles to environmental service systems.
 - ESS.03.03.02.a. Demonstrate knowledge of hydrogeology by differentiating between groundwater and surface water.
 - ESS.03.03.02.b. Describe interactions between groundwater and surface water.
 - ESS.03.03.04.a. Identify environmental hazards associated with groundwater supplies.
 - ESS.03.03.04.b. Describe precautions taken to prevent/reduce contamination of groundwater supplies.
 - ESS.03.03.04.c. Test and document the quality of groundwater supplies.

Next Generation Science Standards (NGSS)

Unit 6: Wildlife Management and Forestry

OVERVIEW

Summary

In Unit 6, students will learn to identify species of trees and other woody plants as well as common wildlife species native to the United States. They will also identify and describe characteristics associated with healthy forested areas and wildlife habitat. With this knowledge, students will be able to identify and describe methods of forest and habitat improvement. As both forests and wildlife are considered natural resources, students will determine how changes over time have impacted these natural resources in both a positive and negative light. Looking forward, they will use this information to determine how forests and wildlife can be utilized and harvested sustainably in the future.

Content to Be Learned

- Morphological characteristics used to identify wildlife species.
- Characteristics of a healthy wildlife habitat.
- Methods of wildlife habitat improvement.
- Morphological characteristics used to identify trees and other woody plants.
- Characteristics of a healthy forest.
- Methods of forest stand improvement.

Practices

- Using models to illustrate characteristics used to identify wildlife species as well as trees and other wood plants.
- Constructing an explanation that describes why forests and wildlife are considered natural resources and the precautions that should be used when planning the future use of these resources.

Crosscutting Concepts

- Cause and effect.
- Structure and function.

Essential Questions

- How do human actions impact the growth and health of forests, wildlife populations, and wildlife habitats and subsequently impact humans?

AFNR Career Cluster Content Standards

- NRS.01.02. Performance Indicator: Classify natural resources.
 - NRS.01.02.03.a. Describe morphological characteristics used to identify wildlife species.
 - NRS.01.02.01.a. Describe morphological characteristics used to identify trees and other woody plants.
 - NRS.01.02.01.b. Identify trees and other woody plants.
- NRS.02.04. Performance Indicator: Demonstrate natural resource enhancement techniques.
 - NRS.02.04.02.a. Identify characteristics of a healthy forest.
 - NRS.02.04.02.b. Identify ways in which forest stands may be improved.
 - NRS.02.04.03.a. Identify characteristics of a healthy wildlife habitat.
 - NRS.02.04.03.b. Identify methods of wildlife habitat improvement.

Next Generation Science Standards