

## AgX Expanded Lesson Review

The following is a compiled listing of the concepts, performance objectives, standards alignment, and essential questions by lesson.

### Lesson 1 Ag in the Past

Concepts	Performance Objectives
<p><i>Students will know and understand</i></p> <ol style="list-style-type: none"> <li>1. Humans consume agricultural products and natural resources.</li> <li>2. Agriculture producers select plant varieties based on their traits and growing environment.</li> <li>3. Accurate records are an essential task during agricultural production.</li> <li>4. Sustainability involves environmental, economic, and social activities supporting a growing population.</li> <li>5. Agriculturists are addressing the needs of a growing world population.</li> </ol>	<p><i>Students will learn concepts by doing</i></p> <ul style="list-style-type: none"> <li>• Simulate a hunter-gatherer society. (Activity 1.1)</li> <li>• Compare and contrast vegetable varieties. (Activity 1.2).</li> <li>• Use production information to select vegetable seeds. (Activity 1.2)</li> <li>• Plant vegetable seeds and keep a record of their growth and care. (Project 1.3)</li> <li>• Identify historical events that have increased the global population. (Activity 1.4)</li> <li>• Sustainably manage a virtual farm. (Activity 1.4)</li> <li>• Construct and design a diversified growing environment with limited space. (Activity 1.5)</li> </ul>

### National Agricultural Literacy Outcomes – Middle School



#### Theme 1: Agriculture and the Environment

- d. Discuss (from multiple perspectives) land and water use by various groups (i.e., ranchers, farmers, hunters, miners, recreational users, government, etc.), and how each use carries a specific set of benefits and consequences that affect people and the environment.
- h. Recognize the factors of an agricultural system which determine its sustainability.

#### Theme 2: Plants and Animals for Food, Fiber, & Energy Outcomes

- a. Describe the differences in plants and animals used for food, clothing, shelter, and fuel before and after European settlement of the United States.

#### Theme 3: Food, Health, and Lifestyle Outcomes

- i. Identify sources of agricultural products that provide food, fuel, clothing, shelter, medical, and other non-food products for their community, state, and/or nation.

#### Theme 4: Science, Technology, Engineering, & Mathematics Outcomes

- c. Describe the process of development from hunting and gathering to farming.

### Next Generation Science Standards – Middle School




#### Disciplinary Core Ideas


##### Life Science

##### LS2: Ecosystems: Interactions,

- LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

<b>Energy, and Dynamics</b>	<ul style="list-style-type: none"> <li>• LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.</li> </ul>
<b>Earth and Space Science</b>	
<b>ESS3: Earth and Human Activity</b>	<ul style="list-style-type: none"> <li>• ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.</li> </ul>

<b>Common Core State Standards – Math – Middle School</b>		
<b>CCSS: Conceptual Category – Geometry</b>		
<b>Grade 6</b>	<ul style="list-style-type: none"> <li>• Solve real-world and mathematical problems involving area, surface area, and volume.</li> </ul>	
<b>Grade 7</b>	<ul style="list-style-type: none"> <li>• Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.</li> </ul>	

<b>Common Core State Standards – ELA – Middle School</b>		
<b>CCSS: English Language Arts Standards » Science &amp; Technical Subjects » Grade 6-8</b>		
<b>Key Ideas and Details</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.3</b> – Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</li> </ul>	
<b>Integration of Knowledge and Ideas</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.7</b> – Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</li> </ul>	
<b>Range of Reading and Level of Text Complexity</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.10</b> – By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.</li> </ul>	

<b>CCSS: English Language Arts Standards » Writing » Grade 6-8</b>		
<b>Text Types and Purposes</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.2</b> – Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</li> <li>• <b>WHST.6-8.2.A</b> – Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.</li> </ul>	
<b>Research to Build and Present Knowledge</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.8</b> – Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.</li> </ul>	
<b>Range of Writing</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.10</b> – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</li> </ul>	

## Essential Questions

1. What was the survival rate for a hunter-gatherer society?
2. Why did humans develop agricultural practices?
3. How do plants today compare to older varieties?
4. Why do producers keep a record of past activities and production?
5. How can agriculturalists manage natural resources to improve access for an increasing population?
6. How does population growth impact agricultural food production?
7. How can food production increase with limited resources?

# Lesson 2 Plants We Grow

Concepts	Performance Objectives
<p><i>Students will know and understand</i></p> <ol style="list-style-type: none"> <li>1. Temperature and water availability impacts a seed's germination rate.</li> <li>2. Plants require a growing media with air, water, organic material, and nutrients.</li> <li>3. Producers use sustainable practices to increase plant and soil health.</li> <li>4. Plants provide aesthetic benefits to humans.</li> </ol>	<p><i>Students will learn concepts by doing</i></p> <ul style="list-style-type: none"> <li>• Evaluate the variables related to seed germination. (Activity 2.1)</li> <li>• Compare soil to a mixed growing media. (Activity 2.2)</li> <li>• Prepare a media in a planter and transplant plants. (Activity 2.3)</li> <li>• Virtually grow crops using traditional and sustainable practices. (Activity 2.4)</li> <li>• Observe the effect of the 4Rs on plant growth. (Activity 2.4)</li> <li>• Construct a floral arrangement to enhance an indoor area. (Project 2.5)</li> </ul>

## National Agricultural Literacy Outcomes – Middle School



### Theme 1: Agriculture and the Environment

- Compare and contrast the advantages and disadvantages involved when converting natural ecosystems to agricultural ecosystems.
- Describe benefits and challenges of using conservation practices for natural resources (e.g., soil, water, and forests), in agricultural systems which impact water, air, and soil quality.
- Discover how natural resources are used and conserved in agriculture (e.g., soil conservation, water conservation).
- Recognize the factors of an agricultural system which determine its sustainability.

### Theme 2: Plants and Animals for Food, Fiber, & Energy Outcomes

- Identify farm practices for plant protection (e.g., using a pesticide, integrated pest management, cultural practices) and the harvest of safe products for consumers.

### Theme 4: Science, Technology, Engineering, & Mathematics Outcomes

- Describe how biological processes influence and are leveraged in agricultural production and processing (e.g., photosynthesis, fermentation, cell division, heredity/genetics, nitrogen fixation).
- Discuss how technology has changed over time to help farmers/ranchers provide more food to more people.
- Explain the harmful and beneficial impacts of various organisms related to agricultural production and processing (e.g., harmful bacteria/beneficial bacteria, harmful/beneficial insects) and the technology developed to influence these organisms.

## Next Generation Science Standards – Middle School



### Disciplinary Core Ideas

#### Life Science

##### LS2: Ecosystems: Interactions, Energy, and Dynamics

- LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
- LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

#### Earth and Space Science

##### ESS3: Earth and Human Activity

- ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

	<ul style="list-style-type: none"> <li>• ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.</li> </ul>
<b>Physical Science</b>	
<b>PS1: Matter and Its Interactions</b>	<ul style="list-style-type: none"> <li>• PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.</li> <li>• PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.</li> <li>• PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.</li> <li>• PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.</li> <li>• PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.</li> <li>• PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.</li> </ul>

## Common Core State Standards – ELA – Middle School



### CCSS: English Language Arts Standards » Science & Technical Subjects » Grade 6-8

<b>Key Ideas and Details</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.3</b> – Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</li> </ul>
<b>Craft and Structure</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.4</b> – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.</li> </ul>
<b>Integration of Knowledge and Ideas</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.7</b> – Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</li> <li>• <b>RST.6-8.9</b> – Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.</li> </ul>
<b>Range of Reading and Level of Text Complexity</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.10</b> – By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.</li> </ul>

### CCSS: English Language Arts Standards » Writing » Grade 6-8

<b>Research to Build and Present Knowledge</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.7</b> – Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.</li> </ul>
<b>Range of Writing</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.10</b> – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</li> </ul>

## Essential Questions

1. What resources does a seed need to germinate?
2. How does a seed grow?
3. What are the different types of growing media?
4. How are soil and soilless media different?
5. What is a healthy soil?
6. How can we increase plant production while sustaining our resources?
7. What do plants need to be healthy and productive?
8. How are plants beneficial to people?
9. How are plants used as an artistic expression?

# Lesson 3 Resources We Use

Concepts	Performance Objectives
<p><i>Students will know and understand</i></p> <ol style="list-style-type: none"> <li>1. Clothing and plastics are comprised of plant and animal byproducts.</li> <li>2. Woods are used for structure and household items.</li> <li>3. Human activities impact natural resource availability.</li> <li>4. Fertilizer selection is a sustainable practice.</li> </ol>	<p><i>Students will learn concepts by doing</i></p> <ul style="list-style-type: none"> <li>• Identify characteristics of common animal and plant fibers. (Activity 3.1)</li> <li>• Produce biodegradable plastic from crops. (Activity 3.2)</li> <li>• Identify the properties of wood and explain how consumers use them. (Activity 3.3)</li> <li>• Evaluate the effect of human activity on natural resources availability. (Activity 3.4)</li> <li>• Use sustainable practices to reduce fertilizer runoff. (Activity 3.5)</li> </ul>

## National Agricultural Literacy Outcomes – Middle School



### Theme 1: Agriculture and the Environment

- b. Describe benefits and challenges of using conservation practices for natural resources (e.g., soil, water, and forests), in agricultural systems which impact water, air, and soil quality.
- c. Discover how natural resources are used and conserved in agriculture (e.g., soil conservation, water conservation). Recognize the factors of an agricultural system which determine its sustainability.
- h. Recognize the factors of an agricultural system which determine its sustainability.

### Theme 2: Plants and Animals for Food, Fiber, & Energy Outcomes

- b. Explain the role of ethics in the production and management of food, fiber (fabric or clothing), and energy sources.
- d. Identify renewable and nonrenewable energy sources.

### Theme 3: Food, Health, and Lifestyle Outcomes

- f. Explain the role of ethics in the production and management of food, fiber (fabric or clothing), and energy sources.
- i. Identify sources of agricultural products that provide food, fuel, clothing, shelter, medical, and other non-food products for their community, state, and/or nation.

### Theme 4: Science, Technology, Engineering, & Mathematics Outcomes

- i. Provide examples of science and technology used in agricultural systems (e.g., GPS, artificial insemination, biotechnology, soil testing, ethanol production, etc.); explain how they meet our basic needs; and detail their social, economic, and environmental impacts.

## Next Generation Science Standards – Middle School



### Disciplinary Core Ideas

#### Life Science

##### LS2: Ecosystems: Interactions, Energy, and Dynamics

- LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

#### Earth and Space Science

##### ESS3: Earth and Human Activity

- ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

#### Physical Science

<b>PS1: Matter and Its Interactions</b>	<ul style="list-style-type: none"> <li>• PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.</li> <li>• PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.</li> <li>• PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.</li> </ul>
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## Common Core State Standards – Math – Middle School



### CCSS: Ratios and Proportional Relationships

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|----------------|--|
| <b>Grade 6</b> | • Understand ratio concepts and use ratio reasoning to solve problems.                           |
| <b>Grade 7</b> | • Analyze proportional relationships and use them to solve real-world and mathematical problems. |

### CCSS: Conceptual Category – Expressions and Equations

- |                |  |
|----------------|--|
| <b>Grade 6</b> | • Represent and analyze quantitative relationships between dependent and independent variables.  |
| <b>Grade 7</b> | • Use properties of operations to generate equivalent expressions.<br>• Solve real-life and mathematical problems using numerical and algebraic expressions and equations. |
| <b>Grade 8</b> | • Understand the connections between proportional relationships, lines, and linear equations.  |

## Common Core State Standards – ELA – Middle School



### CCSS: English Language Arts Standards » Science & Technical Subjects » Grade 6-8

<b>Key Ideas and Details</b>	• <b>RST.6-8.3</b> – Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
<b>Integration of Knowledge and Ideas</b>	• <b>RST.6-8.7</b> – Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
<b>Range of Reading and Level of Text Complexity</b>	• <b>RST.6-8.10</b> – By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.

### CCSS: English Language Arts Standards » Writing » Grade 6-8

<b>Production and Distribution of Writing</b>	• <b>WHST.6-8.4</b> – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. • <b>WHST.6-8.6</b> – Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
<b>Research to Build and Present Knowledge</b>	• <b>WHST.6-8.7</b> – Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
<b>Range of Writing</b>	• <b>WHST.6-8.10</b> – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

## Essential Questions

1. What are the natural resources used for making my clothes?
2. What plastic alternatives exist to reduce pollution?
3. What are the advantages and disadvantages of biodegradable plastics?
4. What are the differences between hardwoods and softwoods?
5. How are composite woods produced?
6. How does human activity impact resource availability?
7. What features should producers and gardeners consider when selecting a fertilizer?



# Lesson 4 Resources We Use

Concepts	Performance Objectives
<p><i>Students will know and understand</i></p> <ol style="list-style-type: none"> <li>Ecosystems are self-sustaining environments.</li> <li>Agriculturalists use sustainable practices to conserve freshwater.</li> <li>Sustainable practices improve water quality.</li> <li>Recycling of natural resources decreases waste and pollution.</li> </ol>	<p><i>Students will learn concepts by doing</i></p> <ul style="list-style-type: none"> <li>Construct and monitor a compost tower in a garden. (Activity 4.2)</li> <li>Virtually grow crops and implement water conservation practices. (Activity 4.3)</li> <li>Explore the influence of mulch on soil moisture and temperature. (Activity 4.3)</li> <li>Design a system to filter polluted water. (Activity 4.4)</li> <li>Compare recyclable natural resources. (Activity 4.1)</li> <li>Design a prototype using sustainable practices. (Problem 4.5)</li> </ul>

## National Agricultural Literacy Outcomes – Middle School



### Theme 1: Agriculture and the Environment

- b. Describe benefits and challenges of using conservation practices for natural resources (e.g., soil, water, and forests), in agricultural systems which impact water, air, and soil quality.
- c. Discover how natural resources are used and conserved in agriculture (e.g., soil conservation, water conservation).
- d. Discuss (from multiple perspectives) land and water use by various groups (i.e., ranchers, farmers, hunters, miners, recreational users, government, etc.), and how each use carries a specific set of benefits and consequences that affect people and the environment.
- g. Recognize how climate and natural resources determine the types of crops and livestock that can be grown and raised for consumption.
- h. Recognize the factors of an agricultural system which determine its sustainability.

### Theme 2: Plants and Animals for Food, Fiber, & Energy Outcomes

- f. Identify where labeling indicates the origin of food and fiber (fabric or clothing)

### Theme 4: Science, Technology, Engineering, & Mathematics Outcomes

- b. Describe how biological processes influence and are leveraged in agricultural production and processing (e.g., photosynthesis, fermentation, cell division, heredity/genetics, nitrogen fixation).
- e. Explain how and why agricultural innovation influenced modern economic systems.

## Next Generation Science Standards – Middle School



### Disciplinary Core Ideas

#### Life Science

<p><b>LS1: From Molecules to Organisms: Structures and Processes</b></p>	<ul style="list-style-type: none"> <li>• LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.</li> <li>• LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.</li> <li>• LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.</li> </ul>
<p><b>LS2: Ecosystems: Interactions, Energy, and Dynamics</b></p>	<ul style="list-style-type: none"> <li>• LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.</li> <li>• LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.</li> </ul>

#### Earth and Space Science

<b>ESS3: Earth and Human Activity</b>	<ul style="list-style-type: none"> <li>• ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.</li> <li>• ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.</li> </ul>
<b>Engineering, Technology, and the Application of Science</b>	
<b>ETS1: Engineering Design</b>	<ul style="list-style-type: none"> <li>• ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</li> <li>• ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.</li> <li>• ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</li> <li>• ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.</li> </ul>

## Common Core State Standards – ELA – Middle School



### CCSS: English Language Arts Standards » Science & Technical Subjects » Grade 6-8

<b>Key Ideas and Details</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.1</b> – Cite specific textual evidence to support analysis of science and technical texts.</li> <li>• <b>RST.6-8.2</b> – Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.</li> <li>• <b>RST.6-8.3</b> – Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</li> </ul>
<b>Craft and Structure</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.4</b> – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.</li> </ul>
<b>Integration of Knowledge and Ideas</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.7</b> – Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</li> </ul>
<b>Range of Reading and Level of Text Complexity</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.10</b> – By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.</li> </ul>

### CCSS: English Language Arts Standards » Writing » Grade 6-8

<b>Text Types and Purposes</b>	<p><b>WHST.6-8.2</b> – Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> <li>• <b>WHST.6-8.2.B</b> – Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.</li> <li>• <b>WHST.6-8.2.D</b> – Use precise language and domain-specific vocabulary to inform about or explain the topic.</li> <li>• <b>WHST.6-8.2.F</b> – Provide a concluding statement or section that follows from and supports the information or explanation presented.</li> </ul>
<b>Production and Distribution of Writing</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.4</b> – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</li> </ul>
<b>Research to Build and Present Knowledge</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.7</b> – Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.</li> <li>• <b>WHST.6-8.9</b> – Draw evidence from informational texts to support analysis, reflection, and research.</li> </ul>
<b>Range of Writing</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.10</b> – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</li> </ul>

## Essential Questions


1. How can you create a self-sustaining ecosystem within your garden?
2. What everyday materials decompose to produce compost?
3. How does the water cycle impact freshwater availability?




4. How can producers conserve water?
5. What types of soil media filter solids?
6. How are pollutants removed from water?
7. What can you do to reduce, reuse, and recycle at home?
8. What products can we recycle?
9. What are the processes for recycling materials?
10. How can manufacturers incorporate the three R's?

## Lesson 5 Energy We Consume

Concepts	Performance Objectives
<p><i>Students will know and understand</i></p> <ol style="list-style-type: none"> <li>1. Consumers use energy from natural sources.</li> <li>2. Ethanol is a renewable energy source that supports the agricultural industry.</li> <li>3. Agricultural processing can result in byproducts with different nutritional values.</li> </ol>	<p><i>Students will learn concepts by doing</i></p> <ul style="list-style-type: none"> <li>• Design and construct a solar oven to cook s'mores. (Project 5.1)</li> <li>• Compare energy from multiple sources. (Activity 5.2)</li> <li>• Produce ethanol from corn-based sources. (Activity 5.3)</li> <li>• Compare protein and energy content of grain and distillers grain. (Activity 5.4)</li> </ul>

National Agricultural Literacy Outcomes – Middle School	
<b>Theme 1: Agriculture and the Environment</b>	
h. Recognize the factors of an agricultural system which determine its sustainability.	
<b>Theme 2: Plants and Animals for Food, Fiber, &amp; Energy Outcomes</b>	
b. Explain the role of ethics in the production and management of food, fiber (fabric or clothing), and energy sources.	
d. Identify renewable and non-renewable energy sources.	
<b>Theme 3: Food, Health, and Lifestyle Outcomes</b>	
f. Explain the role of ethics in the production and management of food, fiber (fabric or clothing), and energy sources.	
i. Identify sources of agricultural products that provide food, fuel, clothing, shelter, medical, and other non-food products for their community, state, and/or nation.	
j. Identify the careers in food production, processing, and nutrition that are essential for a healthy food supply.	
<b>Theme 4: Science, Technology, Engineering, &amp; Mathematics Outcomes</b>	
b. Describe how biological processes influence and are leveraged in agricultural production and processing (e.g., photosynthesis, fermentation, cell division, heredity/genetics, nitrogen fixation).	
g. Identify science careers related to both producers and consumers of agricultural products.	

Next Generation Science Standards – Middle School	
<b>Disciplinary Core Ideas</b>	
<b>Life Science</b>	
<b>LS2: Ecosystems: Interactions, Energy, and Dynamics</b>	LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
<b>Physical Science</b>	

<b>PS1: Matter and Its Interactions</b>	PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
<b>PS3: Energy</b>	PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
<b>Engineering, Technology, and the Application of Science</b>	
<b>ETS1: Engineering Design</b>	ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

## Common Core State Standards – Math – Middle School



### CCSS: Conceptual Category – Expressions and Equations

<b>Grade 6</b>	Represent and analyze quantitative relationships between dependent and independent variables.
<b>Grade 7</b>	Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
<b>Grade 8</b>	Understand the connections between proportional relationships, lines, and linear equations.

### CCSS: Conceptual Category – Statistics and Probability

<b>Grade 7</b>	Use random sampling to draw inferences about a population.
<b>Grade 8</b>	Investigate patterns of association in bivariate data.

## Common Core State Standards – ELA – Middle School



### CCSS: English Language Arts Standards » Science & Technical Subjects » Grade 6-8

<b>Key Ideas and Details</b>	<ul style="list-style-type: none"> <li>○ <b>RST.6-8.1</b> – Cite specific textual evidence to support analysis of science and technical texts.</li> <li>○ <b>RST.6-8.3</b> – Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</li> </ul>
<b>Integration of Knowledge and Ideas</b>	<ul style="list-style-type: none"> <li>○ <b>RST.6-8.7</b> – Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</li> </ul>
<b>Range of Reading and Level of Text Complexity</b>	<ul style="list-style-type: none"> <li>○ <b>RST.6-8.10</b> – By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.</li> </ul>

### CCSS: English Language Arts Standards » Writing » Grade 6-8

<b>Text Types and Purposes</b>	<p><b>WHST.6-8.1</b> – Write arguments focused on discipline-specific content.</p> <ul style="list-style-type: none"> <li>○ <b>WHST.6-8.1.B</b> – Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.</li> </ul>
	<p><b>WHST.6-8.2</b> – Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> <li>○ <b>WHST.6-8.2.A</b> – Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.</li> <li>○ <b>WHST.6-8.2.B</b> – Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.</li> <li>○ <b>WHST.6-8.2.C</b> – Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.</li> <li>○ <b>WHST.6-8.2.D</b> – Use precise language and domain-specific vocabulary to inform about or explain the topic.</li> <li>○ <b>WHST.6-8.2.E</b> – Establish and maintain a formal style and objective tone.</li> </ul>

**Research to Build and Present Knowledge**

**Range of Writing**

- **WHST.6-8.2.F** – Provide a concluding statement or section that follows from and supports the information or explanation presented.
- **WHST.6-8.7** – Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
- **WHST.6-8.8** – Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
- **WHST.6-8.10** – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

**Essential Questions**

1. How is agriculture involved in energy production?
2. Are all energy sources the same?
3. What is the best energy source?
4. What is the source of the energy I use?
5. How do by-products increase the value of an agricultural crop?
6. Should crops be used for fuel?

**Lesson 6 Animals We Care For**

<b>Concepts</b>	<b>Performance Objectives</b>
<p><i>Students will know and understand</i></p> <ol style="list-style-type: none"> <li>1. Plants and animals are dependent upon each other.</li> <li>2. Throughout history, animals have played many roles in developing human civilizations.</li> <li>3. Humans used selective breeding to raise animals for specific purposes.</li> <li>4. Proper handling techniques are essential for keeping the animal and handler safe.</li> <li>5. Animal producers are responsible for selecting equipment that meets an animal’s needs.</li> </ol>	<p><i>Students will learn concepts by doing</i></p> <ul style="list-style-type: none"> <li>• Match pollinators with flowers they pollinate. (Activity 6.1)</li> <li>• Pollinate cucumber flowers. (Activity 6.1)</li> <li>• Compare precursor and modern domesticated animal species. (Activity 6.2)</li> <li>• Compare breeds within a chosen species. (Activity 6.3)</li> <li>• Practice tying halters and knots for handling large animals. (Activity 6.4)</li> <li>• Demonstrate how to hold different animal species. (Activity 6.4)</li> <li>• Select equipment to care for a specific animal. (Activity 6.5)</li> <li>• Design and test bedding to keep an animal comfortable, warm, and dry. (Project 6.6)</li> </ul>


- a. Describe the differences in plants and animals used for food, clothing, shelter, and fuel before and after European settlement of the United States.
- b. Explain the role of ethics in the production and management of food, fiber (fabric or clothing), and energy sources.
- e. Identify strategies for housing for animal welfare and the safety of animal products (e.g., meat, milk, eggs).


### Theme 3: Food, Health, and Lifestyle Outcomes


- i. identify sources of agricultural products that provide food, fuel, clothing, shelter, medical, and other non-food products for their community, state, and/or nation.

### Theme 3: Food, Health, and Lifestyle Outcomes

- b. Describe how biological processes influence and are leveraged in agricultural production and processing (e.g., photosynthesis, fermentation, cell division, heredity/genetics, nitrogen fixation).
- g. Identify science careers related to both producers and consumers of agricultural products.

Next Generation Science Standards – <b>Middle School</b>		
<b>Disciplinary Core Ideas</b>		
<b>Life Science</b>		
<b>LS1: From Molecules to Organisms: Structures and Processes</b>	<ul style="list-style-type: none"> <li>• LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.</li> <li>• LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.</li> </ul>	
<b>LS4: Biological Evolution: Unity and Diversity</b>	<ul style="list-style-type: none"> <li>• LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.</li> </ul>	
<b>Physical Science</b>		
<b>PS3: Energy</b>	<ul style="list-style-type: none"> <li>• PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.</li> </ul>	
<b>Engineering, Technology, and the Application of Science</b>		
<b>ETS1: Engineering Design</b>	<ul style="list-style-type: none"> <li>• ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.</li> <li>• ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.</li> </ul>	

Common Core State Standards – Math – <b>Middle School</b>		
<b>CCSS: Conceptual Category – The Number System</b>		
<b>Grade 6</b>	<ul style="list-style-type: none"> <li>• Apply and extend previous understandings of numbers to the system of rational numbers.</li> </ul>	

Common Core State Standards – ELA – <b>Middle School</b>		
<b>CCSS: English Language Arts Standards » Science &amp; Technical Subjects » Grade 6-8</b>		
<b>Key Ideas and Details</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.3</b> – Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</li> </ul>	
<b>Integration of Knowledge and Ideas</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.7</b> – Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</li> </ul>	
<b>Range of Reading and Level of Text Complexity</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.10</b> – By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.</li> </ul>	

<b>CCSS: English Language Arts Standards » Writing » Grade 6-8</b>		
<b>Text Types and Purposes</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.1</b> – Write arguments focused on discipline-specific content.</li> <li>• <b>WHST.6-8.1.A</b> – Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.</li> </ul>	

	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.1.B</b> – Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.</li> </ul> <p><b>WHST.6-8.2</b> – Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> <li>• <b>WHST.6-8.2.B</b> – Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.</li> <li>• <b>WHST.6-8.2.D</b> – Use precise language and domain-specific vocabulary to inform about or explain the topic.</li> </ul>
<b>Production and Distribution of Writing</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.4</b> – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</li> <li>• <b>WHST.6-8.6</b> – Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.</li> </ul>
<b>Research to Build and Present Knowledge</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.8</b> – Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.</li> </ul>
<b>Range of Writing</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.10</b> – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</li> </ul>

## Essential Questions

1. Why are animals needed for plant reproduction?
2. How do flowers attract animals?
3. Why were some species domesticated before others?
4. What is selective breeding?
5. What are the differences between visible and invisible traits?
6. How are large animals handled safely?
7. Why is knot tying an important skill when working with large animals?
8. What equipment do you need when caring for a pet?
9. How do you select the equipment needed to care for an animal?
10. What are a pet owner's responsibilities?
11. What is the purpose of animal bedding?

## Lesson 7 Food We Eat

Concepts	Performance Objectives
<p><i>Students will know and understand</i></p> <ol style="list-style-type: none"> <li>1. Food processors convert raw products into palatable food.</li> <li>2. Food safety practices make food more available.</li> <li>3. Sensory properties of food influence consumer preference and acceptance.</li> <li>4. Plant products contain essential nutrients.</li> </ol>	<p><i>Students will learn concepts by doing</i></p> <ul style="list-style-type: none"> <li>• Mill flour from wheat and evaluate protein differences across flour types. (Activity 7.1)</li> <li>• Process food products from raw commodities. (Activity 7.5)</li> <li>• Compare cleaning methods for fresh fruits and vegetables. (Activity 7.2)</li> <li>• Evaluate different varieties of pickles. (Activity 7.3)</li> <li>• Develop a food label for a jar of pickles and identify major nutrients. (Activity 7.4)</li> </ul>



## National Agricultural Literacy Outcomes – Middle School



### Theme 3: Food, Health, and Lifestyle Outcomes

- a. Demonstrate safe methods for food handling, preparation, and storage in the home.
- b. Evaluate food labels to determine food sources that meet nutritional needs.
- c. Evaluate serving size related to nutritional needs.
- d. Explain how factors, such as culture, convenience, access, and marketing affect food choices locally, regionally, and globally.
- e. Explain the benefits and disadvantages of food processing.
- g. Identify agricultural products (foods) that provide valuable nutrients for a balanced diet.
- h. Identify forms and sources of food contamination relative to personal health and safety.
- i. Identify sources of agricultural products that provide food, fuel, clothing, shelter, medical, and other non-food products for their community, state, and/or nation.

### Theme 3: Food, Health, and Lifestyle Outcomes

- a. Compare and contrast historical and current food processing and systems.

## Next Generation Science Standards – Middle School



### Disciplinary Core Ideas

#### Life Science

##### LS4: Biological Evolution: Unity and Diversity

- LS4-5. Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.

#### Engineering, Technology, and the Application of Science

##### ETS1: Engineering Design

- ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

## Common Core State Standards – ELA – Middle School



### CCSS: English Language Arts Standards » Science & Technical Subjects » Grade 6-8

<b>Key Ideas and Details</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.3</b> – Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</li> </ul>
<b>Integration of Knowledge and Ideas</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.7</b> – Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</li> </ul>
<b>Range of Reading and Level of Text Complexity</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.10</b> – By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.</li> </ul>

### CCSS: English Language Arts Standards » Writing » Grade 6-8

<b>Research to Build and Present Knowledge</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.7</b> – Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.</li> </ul>
<b>Range of Writing</b>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.10</b> – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</li> </ul>

## Essential Questions

1. How is flour processed?
2. Why are there different flour types?

3. What is the best cleaning method for raw fruits and vegetables?
4. What are the components of a food nutrition label?
5. How do our senses impact the palatability of food?
6. How is food processed from a raw commodity into a commercial good?

## Lesson 8 Ag in My Future

Concepts	Performance Objectives
<p><i>Students will know and understand</i></p> <ol style="list-style-type: none"> <li>1. A wide variety of careers exist within agriculture.</li>   <li>2. Agricultural commodities are processed into useable consumer products.</li> </ol>	<p><i>Students will learn concepts by doing</i></p> <ul style="list-style-type: none"> <li>• Use past course experiences to plan a potential SAE Project. (Project 8.2)</li> <li>• Share SAE ideas with classmates. (Activity 8.3)</li> <li>• Reflect on skills learned and safety procedures practiced during AgX. (Activity 8.2)</li>   <li>• Produce a salve and create a leather key fob from animal byproducts. (Activity 8.1)</li> <li>• Explain how agricultural products follow the value chain from field to fork. (Activity 8.3)</li>   <li>• Prepare a salad, bread, butter, and ice cream to consume in class. (Activity 8.3)</li> </ul>

### National Agricultural Literacy Outcomes – Middle School



#### Theme 3: Food, Health, and Lifestyle Outcomes

a. Demonstrate safe methods for food handling, preparation, and storage in the home.

Explain the benefits and disadvantages of food processing.

Identify the careers in food production, processing, and nutrition that are essential for a healthy food supply.

i. Identify sources of agricultural products that provide food, fuel, clothing, shelter, medical, and other non-food products for their community, state, and/or nation.

Identify the careers in food production, processing, and nutrition that are essential for a healthy food supply.

#### Theme 5: Culture, Society, Economy, & Geography Outcomes

Distinguish between careers in production (farmers and ranchers) with those that directly involve consumers (business and nutrition).

### Common Core State Standards – ELA – Middle School



#### CCSS: English Language Arts Standards » Science & Technical Subjects » Grade 6-8

<b>Key Ideas and Details</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.2</b> – Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.</li> <li>• <b>RST.6-8.3</b> – Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.</li> </ul>
<b>Craft and Structure</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.4</b> – Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.</li> </ul>
<b>Range of Reading and Level of Text Complexity</b>	<ul style="list-style-type: none"> <li>• <b>RST.6-8.10</b> – By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.</li> </ul>

#### CCSS: English Language Arts Standards » Writing » Grade 6-8

<p><b>Text Types and Purposes</b></p>	<p><b>WHST.6-8.2</b> – Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <ul style="list-style-type: none"> <li>• <b>WHST.6-8.2.A</b> – Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.</li> <li>• <b>WHST.6-8.2.B</b> – Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.</li> <li>• <b>WHST.6-8.2.D</b> – Use precise language and domain-specific vocabulary to inform about or explain the topic.</li> </ul>
<p><b>Production and Distribution of Writing</b></p>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.4</b> – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</li> <li>• <b>WHST.6-8.6</b> – Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.</li> </ul>
<p><b>Range of Writing</b></p>	<ul style="list-style-type: none"> <li>• <b>WHST.6-8.10</b> – Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</li> </ul>

## Essential Questions

1. What is your career plan?
2. How will agriculture be part of your future?
3. What can you do to learn more about your agricultural interests?
4. What careers are involved in providing you with food, fiber, and energy?
5. How are commodities processed for consumption?