

## Introduction to Agriculture, Food, and Natural Resources National AFNR Common Career Technical Core Standards Alignment

	Unit 1 The Circles of Agricultural Education	Unit 2 Communicating Today	Unit 3 The Science of Agriculture	Unit 4 Natural Resources	Unit 5 Plants and Animals	Unit 6 Agricultural Power and Technology	Unit 7 Looking Ahead
<b>Career Ready Practices Content Standards</b>							
1. Act as a responsible and contributing citizen and employee.	X	X					
2. Apply appropriate academic and technical skills.	X			X	X	X	
3. Attend to personal health and financial well-being.			X	X			
4. Communicate clearly, effectively and with reason.		X	X	X	X	X	X
5. Consider the environmental, social, and economic impacts of decisions.				X	X	X	X
6. Demonstrate creativity and innovation.					X		X
7. Employ valid and reliable research strategies.			X	X	X	X	
8. Utilize critical thinking to make sense of problems and persevere in solving them.				X	X		X
9. Model integrity, ethical leadership, and effective management.		X					
10. Plan education and career path aligned to personal goals.	X						X
11. Use technology to enhance productivity.			X	X		X	
12. Work productively in teams while using cultural/global competence.		X	X			X	X

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<b>Agriculture, Food, and Natural Resources Career Cluster</b>							
1. Analyze how issues, trends, technologies and public policies impact systems in the Agriculture, Food & Natural Resources Career Cluster.				X	X	X	
2. Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster and the role agriculture, food and natural resources (AFNR) play in society and the economy.	X				X		X
3. Examine and summarize importance of health, safety, and environmental management systems in AFNR organizations.			X		X		
4. Demonstrate stewardship of natural resources in AFNR activities.				X		X	X
5. Describe career opportunities and means to achieve those opportunities in each of the AFNR career pathways.	X						X
6. Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.	X			X	X		
<b>Animal Systems Career Pathway (AG-ANI)</b>							
1. Analyze historic and current trends impacting the animal systems industry.					X		
2. Utilize best practice protocols for husbandry and welfare based upon animal behaviors.							
3. Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction, and/or economic production.					X		
4. Apply principles of animal reproduction given desired outcomes for performance, development, and/or economic production.					X		
5. Evaluate environmental factors affecting animal performance and implement procedures for enhancing performance and animal health.					X		
6. Classify, evaluate, and select animals based on anatomical and physiological characteristics.					X		
7. Apply principles of effective animal health care.							

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<b>Biotechnology Systems Career Pathway Content Standards</b>							
BS.01: Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., historical events, societal trends, ethical and legal implications, etc.).							
BS.02: Demonstrate proficiency by safely applying appropriate laboratory skills to complete tasks in a biotechnology research and development environment (e.g., standard operating procedures, record keeping, aseptic technique, equipment maintenance, etc.).					X		
BS.03: Demonstrate the application of biotechnology to solve problems in AFNR systems (e.g., bioengineering, food processing, waste management, horticulture, forestry, livestock, crops, etc.).							
<b>Environmental Service Systems Content Standards</b>							
1. Use analytical procedures and instruments to manage environmental service systems.							
2. Evaluate the impact of public policies and regulations on environmental service facility operations.							
3. Develop proposed solutions to environmental issues, problems, and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry, and ecology.							
<b>Food Products and Processing Systems (AG-FD)</b>							
1. Develop and implement procedures to ensure safety, sanitation, and quality in food product and processing facilities.							
2. Apply principles of nutrition, biology, microbiology, chemistry and human behavior to the development of food products.							
3. Select and process food products for storage, distribution, and consumption.							
4. Explain the scope of the food industry and the historical and current developments of food product and processing.					X		

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<b>Natural Resource Systems Content Standards</b>							
1. Plan and conduct natural resource management activities that apply logical, reasoned, and scientifically based solutions to natural resource issues and goals.				X		X	
2. Plan and Analyze interrelationships between natural resources and humans needed to manage natural resource systems.				X			
3. Develop plans to ensure sustainable production and processing of natural resources.							
4. Demonstrate responsible control and management procedures and techniques to protect or maintain natural resources.							
<b>Plant Systems Career Pathway Content Standards</b>							
1. Develop and implement a crop management plan for a given production goal that accounts for environmental factors.				X	X		
2. Apply principles of classification, plant anatomy, and plant physiology to plant production and management.					X		
3. Propagate, culture, and harvest plants and plant products based on current industry standards.					X		
4. Apply principles of design in plant systems to enhance an environment (e.g. floral, forest landscape, and farm).							
<b>Power, Structural, and Technical Pathway Content Standards</b>							
1. Apply physical science principles and engineering applications related to mechanical equipment, structures, and biological systems to solve problems and improve performance in power, structural, and technical systems.						X	
2. Operate and maintain mechanical equipment related to AFNR power, structural, and technical systems.							
3. Service and repair mechanical equipment and power systems used in power, structural, and technical systems.							
4. Plan, build and maintain AFNR structures.						X	
5. Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems.						X	
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## Introduction to Agriculture, Food, and Natural Resources Next Generation Science Standards Alignment

	Unit 1 The Circles of Agricultural Education	Unit 2 Communicating Today	Unit 3 The Science of Agriculture	Unit 4 Natural Resources	Unit 5 Plants and Animals	Unit 6 Agricultural Power and Technology	Unit 7 Looking Ahead
<b>Disciplinary Core Ideas</b>							
<b>Life Science</b>							
<b>LS1: From Molecules to Organisms: Structures and Processes</b>							
• LS1.A: Structure and Function					X		
• LS1.B: Growth and Development of Organisms							
• LS1.C: Organization for Matter and Energy Flow in Organisms				X	X		
<b>LS2: Ecosystems: Interactions, Energy, and Dynamics</b>							
• LS2.A: Interdependent Relationships in Ecosystems				X			
• LS2.B: Cycles of Matter and Energy Transfer in Ecosystems				X			
• LS2.C: Ecosystem Dynamics, Functioning, and Resilience				X			
• LS2.D: Social Interactions and Group Behavior							
<b>LS3: Heredity: Inheritance and Variation of Traits</b>							
• LS3.A: Inheritance of Traits					X		
• LS3.B: Variation of Traits					X		
<b>LS4: Biological Evolution: Unity and Diversity</b>							
• LS4.A: Evidence of Common Ancestry and Diversity							
• LS4.B: Natural Selection							
• LS4.C: Adaptation							
• LS4.D: Biodiversity and Humans							X
<b>Earth and Space Science</b>							
<b>ESS1: Earth's Place in the Universe</b>							
• ESS1.A: The Universe and Its Stars							
• ESS1.B: Earth and the Solar System							
• ESS1.C: The History of Planet Earth							
<b>ESS2: Earth's Systems</b>							
• ESS2.A: Earth Materials and Systems							
• ESS2.B: Plate Tectonics and Large-Scale System Interactions							
• ESS2.C: The Roles of Water in Earth's Surface Processes				X			
• ESS2.D: Weather and Climate							
• ESS2.E: Biogeology							

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<b>ESS3: Earth and Human Activity</b>							
• ESS3.A: Natural Resources	X			X		X	
• ESS3.B: Natural Hazards							
• ESS3.C: Human Impacts on Earth Systems				X		X	X
• ESS3.D: Global Climate Change							
<b>Physical Science</b>							
<b>PS1: Matter and Its Interactions</b>							
• PS1.A: Structure and Properties of Matter							
• PS1.B: Chemical Reactions					X		
• PS1.C: Nuclear Processes							
<b>PS2: Motion and Stability: Forces and Interactions</b>							
• PS2.A: Forces and Motion							
• PS2.B: Types of Interactions							
<b>PS3: Energy</b>							
• PS3.A: Definitions of Energy							
• PS3.B: Conservation of Energy and Energy Transfer							
• PS3.C: Relationship Between Energy and Forces							
• PS3.D: Energy in Chemical Processes and Everyday Life							
<b>PS4: Waves and Their Applications in Technologies for Information Transfer</b>							
• PS4.A: Wave Properties							
• PS4.B: Electromagnetic Radiation							
• PS4.C: Information Technologies and Instrumentation							
<b>Engineering, Technology, and the Application of Science</b>							
• ETS1: Engineering Design							
• ETS1.A: Defining and Delimiting Engineering Problems							
• ETS1.B: Developing Possible Solutions							
• ETS1.C: Optimizing the Design Solution							
<b>Science and Engineering Practices</b>							
• Asking Questions and Defining Problems				X	X	X	
• Developing and Using Models					X	X	
• Planning and Carrying Out Investigations			X	X	X	X	
• Analyzing and Interpreting Data	X		X	X	X	X	
• Using Mathematics and Computational Thinking						X	
• Constructing Explanations and Designing Solutions					X		
• Engaging in Argument from Evidence					X	X	
• Obtaining, Evaluating, and Communicating Information			X	X	X	X	

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<b>Crosscutting Concepts</b>							
• Patterns				X	X		
• Cause and Effect: Mechanism and Prediction	X		X	X	X	X	
• Scale, Proportion, and Quantity				X			
• Systems and System Models					X		
• Energy and Matter: Flows, Cycles, and Conservation				X			
• Structure and Function				X	X		
• Stability and Change				X			

<b>Understandings about the Nature of Science</b>							
• Scientific Investigations Use a Variety of Methods			X		X	X	
• Scientific Knowledge is Based on Empirical Evidence						X	
• Scientific Knowledge is Open to Revision in Light of New Evidence							
• Science Models, Laws, Mechanisms, & Theories Explain Natural Phenomena			X				
• Science is a Way of Knowing			X		X		
• Scientific Knowledge Assumes Order & Consistency in Natural Systems					X		
• Science is a Human Endeavor	X		X				
• Science Addresses Questions About the Natural and Material World.					X	X	

## Introduction to Agriculture, Food, and Natural Resources Common Core State Standards for High School Mathematics Alignment

		Unit 1 The Circles of Agricultural Education	Unit 2 Communicating Today	Unit 3 The Science of Agriculture	Unit 4 Natural Resources	Unit 5 Plants and Animals	Unit 6 Agricultural Power and	Unit 7 Looking Ahead
<b>CCSS: Conceptual Category – Number and Quantity</b>								
<b>The Real Number System</b>	<ul style="list-style-type: none"> <li>Extend the properties of exponents to rational exponents.</li> <li>Use properties of rational and irrational numbers.</li> </ul>							
<b>Quantities</b>	<ul style="list-style-type: none"> <li>*Reason quantitatively and use units to solve problems.</li> </ul>			x	x	x	x	
<b>The Complex Number System</b>	<ul style="list-style-type: none"> <li>Perform arithmetic operations with complex numbers.</li> <li>Represent complex numbers and their operations on the complex plane.</li> <li>Use complex numbers in polynomial identities and equations.</li> </ul>							
<b>Vector and Matrix Quantities</b>	<ul style="list-style-type: none"> <li>Represent and model with vector quantities.</li> <li>Perform operations on vectors.</li> <li>Perform operations on matrices and use matrices in applications.</li> </ul>							
<b>CCSS: Conceptual Category – Algebra</b>								
<b>Seeing Structure in Expressions</b>	<ul style="list-style-type: none"> <li>*Interpret the structure of expressions.</li> <li>*Write expressions in equivalent forms to solve problems.</li> </ul>			x	x	x	x	
<b>Arithmetic with Polynomials and Rational Expressions</b>	<ul style="list-style-type: none"> <li>Perform arithmetic operations on polynomials.</li> <li>Understand the relationship between zeros and factors of polynomials.</li> <li>Use polynomial identities to solve problems.</li> <li>Rewrite rational expressions.</li> </ul>			x				
<b>Creating Equations</b>	<ul style="list-style-type: none"> <li>*Create equations that describe numbers or relationships.</li> </ul>							
<b>Reasoning with Equations and Inequalities</b>	<ul style="list-style-type: none"> <li>Understand solving equations as a process of reasoning &amp; explain the reasoning.</li> <li>Solve equations and inequalities in one variable.</li> <li>Solve systems of equations.</li> <li>*Represent and solve equations and inequalities graphically.</li> </ul>					x	x	
						x	x	

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<b>CCSS: Conceptual Category – Geometry</b>								
<b>Congruence</b>	• Experiment with transformations in the plane.							
	• Understand congruence in terms of rigid motions.							
	• Prove geometric theorems.							
	• Make geometric constructions.							
<b>Similarity, Right Triangles, and Trigonometry</b>	• Understand similarity in terms of similarity transformations.							
	• Prove theorems involving similarity.							
	• *Define trigonometric ratios and solve problems involving right triangles.							
	• Apply trigonometry to general triangles.							
<b>Circles</b>	• Understand and apply theorems about circles.							
	• Find arc lengths and areas of sectors of circles.							
<b>Expressing Geometric Properties with Equations</b>	• Translate between the geometric description and the equation for a conic section.							
	• *Use coordinates to prove simple geometric theorems algebraically.							
<b>Geometric Measurement and Dimension</b>	• *Explain volume formulas and use them to solve problems.							
	• Visualize relationships between two-dimensional and three-dimensional objects.						x	
<b>Modeling with Geometry</b>	• *Apply geometric concepts in modeling situations.						x	
<b>CCSS: Conceptual Category – Statistics and Probability</b>								
<b>Interpreting Categorical and Quantitative Data</b>	• *Summarize, represent, and interpret data on a single count or measurement variable.			x		x		
	• *Summarize, represent, and interpret data on two categorical and quantitative variables.							
	• *Interpret linear models.							
<b>Making Inferences and Justifying Conclusions</b>	• *Understand and evaluate random processes underlying statistical experiments.							
	• *Make inferences and justify conclusions from sample surveys, experiments, and observational studies.			x		x		
<b>Conditional Probability and the Rules of Probability</b>	• *Understand independence and conditional probability and use them to interpret data.							
	• *Use the rules of probability to compute probabilities of compound events in a uniform probability model.							
<b>Using Probability to Make Decisions</b>	• *Calculate expected values and use them to solve problems.							
	• *Use probability to evaluate outcomes of decisions.							

## Introduction to Agriculture, Food, and Natural Resources Common Core State Standards for English Language Arts Alignment

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<b>CCSS: English Language Arts Standards » Science &amp; Technical Subjects » Grade 9-10</b>								
<b>Key Ideas and Details</b>	• <b>RST.9-10.1</b> – Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.				X			
	• <b>RST.9-10.2</b> – Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.					X		
	• <b>RST.9-10.3</b> – Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.		X	X	X	X	X	
<b>Craft and Structure</b>	• <b>RST.9-10.4</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 9-10 texts and topics.					X	X	X
	• <b>RST.9-10.5</b> – Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).					X		
	• <b>RST.9-10.6</b> – Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.							
<b>Integration of Knowledge and Ideas</b>	• <b>RST.9-10.7</b> – Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	X			X	X	X	
	• <b>RST.9-10.8</b> – Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.							
	• <b>RST.9-10.9</b> – Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.							X
<b>Range of Reading and Level of Text Complexity</b>	• <b>RST.9-10.10</b> – By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.				X	X		

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<b>CCSS: English Language Arts Standards » Writing » Grade 9-10</b>								
<b>Text Types and Purposes</b>	<b>WHST.9-10.1</b> – Write arguments focused on discipline-specific content.							
	• <b>WHST.9-10.1.A</b> – Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.					X		X
	• <b>WHST.9-10.1.B</b> – Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.						X	X
	• <b>WHST.9-10.1.C</b> – Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.							
	• <b>WHST.9-10.1.D</b> – Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.							X
	• <b>WHST.9-10.1.E</b> – Provide a concluding statement or section that follows from or supports the argument presented.						X	X
	<b>WHST.9-10.2</b> – Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.							
	• <b>WHST.9-10.2.A</b> – Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.		X			X	X	X
	• <b>WHST.9-10.2.B</b> – Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.					X	X	
	• <b>WHST.9-10.2.C</b> – Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.					X		
	• <b>WHST.9-10.2.D</b> – Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.		X			X	X	
	• <b>WHST.9-10.2.E</b> – Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.					X		X
	• <b>WHST.9-10.2.F</b> – Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).		X			X	X	X

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<b>Production and Distribution of Writing</b>	• <b>WHST.9-10.4</b> – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		X		X	X	X	X	
	• <b>WHST.9-10.5</b> – Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.		X		X			X	
	• <b>WHST.9-10.6</b> – Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.		X			X	X	X	X
<b>Research to Build and Present Knowledge</b>	• <b>WHST.9-10.7</b> – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.		X		X	X	X	X	
	• <b>WHST.9-10.8</b> – Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.		X					X	X
	• <b>WHST.9-10.9</b> – Draw evidence from informational texts to support analysis, reflection, and research.					X			X
<b>Range of Writing</b>	• <b>WHST.9-10.10</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.	X	X	X	X	X	X	X	