

# End of Course Assessment Blueprint

## Introduction to Agriculture, Food, and Natural Resources EoC

The **End of Course Assessment Blueprint** aligns CASE 4 Learning (CASE) Concepts and Performance Objectives to the National AFNR Content standards and performance indicators developed by the National Council for Agricultural Education (The Council). The concepts and performance objectives listed in this blueprint are assessed in the **Introduction to Agriculture, Food, and Natural Resources End-of-Course Assessment**. The assessment is available through **NOCTI**, serving as a CASE partner for third-party delivery. Teachers should use this blueprint to prepare their students for the comprehensive **Introduction to Agriculture, Food, and Natural Resources End-of-Course Assessment**.

In the CASE learning model, Concepts are key elements of understanding that students are expected to learn. Concepts are developed by a curriculum committee of content experts comprised of industry representatives, post-secondary educators, and secondary teachers. Performance Objectives are how students will demonstrate their understanding of the concept. All Concepts and Performance Objectives measure student competency of the AFNR Content Standards. The AFNR Content Standards provide state agricultural education leaders and educators with a high-quality, rigorous set of standards to guide what students should know and be able to do after completing a program of study in each of the following AFNR Career Pathways.

- Career Ready Practices (Integrated)
- Foundational Pathway Skills (Integrated)
- Agribusiness Systems
- Animal Systems
- Biotechnology Systems
- Education, Communication, and Leadership
- Environmental Sustainability Systems
- Food Products and Processing Systems
- Natural Resource Systems
- Plant Systems
- Power, Structural, and Technical Systems

DEFINITIONS: Within each pathway, the standards are organized and aligned to the CASE curriculum as follows:

- **Standards** – These are the standards owned by Advance CTE and used here with permission. The standards defined the scope and guided the development of the updated indicators and CASE measurements.
- **Performance Indicators** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.
- **CASE Measurements** – These are CASE Concepts with bulleted Performance Objectives. Students carry out the Performance Objectives to show understanding of the Concept, which indicates attainment of each performance indicator. The beginning CASE measurements require students to remember, understand, identify, explain, and summarize information. The intermediate CASE measurements require students to apply, analyze, compare, distinguish, and examine information and scenarios. The advanced CASE measurements require students to assess, evaluate, justify, improve, and create.

The **Introduction to Agriculture, Food, and Natural Resources End-of-Course Assessment** measures student competencies in the AFNR Pathways included in this blueprint. For more information about the National AFNR Content Standards, visit The National Council for Agricultural Education’s website at <https://www.thencaae.org/afnr-standards>.

### CAREER READY PRACTICES STANDARD

CRP.04. Communicate clearly, effectively and with reason.

Career-ready individuals communicate thoughts, ideas and action plans with clarity, whether using written, verbal and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
CRP.04.01. Communicate using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.		2.1 Concept 1 People utilize multiple forms of verbal and nonverbal communication. <ul style="list-style-type: none"> <li>Demonstrate verbal and non-verbal forms of communication in a charades-like game.</li> <li>Identify and select appropriate attire for different activities.</li> <li>Prepare a formal introduction</li> </ul>	
		2.1 Concept 2 Voice, presence, and expression are used in communicating effectively. <ul style="list-style-type: none"> <li>Present a formal introduction.</li> <li>Practice effective public speaking characteristics.</li> </ul>	

### FOUNDATIONAL PATHWAY SKILLS STANDARD

FPS.02. Evaluate the nature and scope of the Agriculture, Food & Natural Resources Career Cluster and the role of agriculture, food and natural resources (AFNR) in society and the economy.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.02.02. Examine the impact of AFNR on the local, state, national, and global society and economy.	1.1 Concept 4 Production of agricultural commodities occurs within specific regions of the United States. <ul style="list-style-type: none"> <li>Research top commodities produced in the United States and determine the costs of food to consumers.</li> </ul>		

**FOUNDATIONAL PATHWAY SKILLS STANDARD**

FPS.03. Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.03.04. Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.		3.1 Concept 4 Reading and understanding laboratory procedures are essential to conducting a laboratory experiment safely.	3.1 Concept 1 Laboratory equipment has specific uses in scientific experiments.
		<ul style="list-style-type: none"> <li>• Complete a laboratory exercise by following written procedures.</li> </ul>	
		3.1 Concept 5 Mass, volume, temperature, and density are common laboratory measurements.	
		<ul style="list-style-type: none"> <li>• Measure distance, volume, mass, temperature, and density using the appropriate tools and scale.</li> </ul>	

**FOUNDATIONAL PATHWAY SKILLS STANDARD**

FPS.06. Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.06.01. Examine and explain foundational cycles and systems of AFNR.	1.1 Concept 1 Agriculture and natural resource systems provide the three basic human needs of food, clothing, and shelter.	1.1 Concept 3 Agriculture is a broad field of study that includes agriculture systems, natural resource management, science, business, communication, and leadership.	
	<ul style="list-style-type: none"> <li>• Determine if their basic needs are met after simulating the collection of resources during different situations.</li> </ul>	<ul style="list-style-type: none"> <li>• Interpret types of activities associated with agriculture from a case study about an agricultural entrepreneur.</li> </ul>	

**FOUNDATIONAL PATHWAY SKILLS STANDARD**

FPS.13. Analyze the structures and procedures to effectively and professionally run and manage a meeting.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.13.01. Utilize parliamentary resources to solve problems of organizational management and operations.		2.2 Concept 2 Parliamentary procedures are used to conduct orderly meetings.	
		<ul style="list-style-type: none"> <li>• Use proper parliamentary procedures to voice an opinion.</li> </ul>	

		<ul style="list-style-type: none"> <li>• Demonstrate the proper procedures for making a main motion and an amendment.</li> </ul>	
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### ANIMAL SYSTEMS STANDARD

AS.04. Apply principles of animal reproduction to achieve desired outcomes for performance, development and/or economic production.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
AS.04.03. Apply scientific principles to animal breeding.	5.1 Concept 4 DNA is genetic material that combined with protein comprises the chromosomes found inside animal and plant cell nuclei.	5.1 Concept 6 Offspring of animals and plants derive their genetic traits from both parents.	
	<ul style="list-style-type: none"> <li>• Extract the DNA bundles from strawberry tissue for observation.</li> <li>• Construct a DNA model and demonstrate how DNA replication happens in a cell.</li> </ul>	<ul style="list-style-type: none"> <li>• Link similarities in characteristics to trace dog traits.</li> </ul>	

### ANIMAL SYSTEMS STANDARD

AS.06. Classify, evaluate and select animals based on anatomical and physiological characteristics.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
AS.06.02. Apply principles of comparative anatomy and physiology to uses within various animal systems.	5.1 Concept 1 Animal and plant cells have many similarities, especially in regards to cell function; however, there are important structural differences between the two cell types.	5.4 Concept 3 Body parts of animals vary among different species.	
	<ul style="list-style-type: none"> <li>• Identify and label a cell's parts, including each organelle's function.</li> <li>• Determine structural differences between an animal and plant cell.</li> </ul>	<ul style="list-style-type: none"> <li>• Create a review game of the external anatomy of an animal that will be used to teach others.</li> </ul>	
	5.1 Concept 2 The nucleus of an animal and a plant cell is important for several life sustaining processes, such as cell division and protein synthesis.	5.5 Concept 3 Animals perceive potential dangers differently than humans.	
	<ul style="list-style-type: none"> <li>• Describe the structure and function of a cell's nucleus.</li> </ul>	<ul style="list-style-type: none"> <li>• Draw conclusions on the perceptions of stimuli based on observations of optical illusions.</li> </ul>	
	5.4 Concept 2 Animals have a complex set of systems that must work together.	5.5 Concept 4 Production and management of animals are based on anatomical and physiological characteristics.	
	<ul style="list-style-type: none"> <li>• Connect the internal body systems and their relationships using concept mapping software.</li> </ul>	<ul style="list-style-type: none"> <li>• Match characteristics of various animals to specialized practices related to animals.</li> </ul>	

**ENVIRONMENTAL SUSTAINABILITY SYSTEMS STANDARD**

ESS.01. Use analytical procedures and instruments to manage environmental service systems.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
ESS.01.01. Analyze and interpret laboratory and field cases in environmental sustainability systems.	3.2 Concept 3 The pH scale is 0-14 where 0 is extremely acidic, 7 is neutral, and 14 is extremely basic.	4.3 Concept 2 Land topography influences the distribution of water and pollutants.	
	<ul style="list-style-type: none"> <li>Quantify the pH of a substance using Vernier equipment and a pH sensor.</li> </ul>	<ul style="list-style-type: none"> <li>Model and observe the flow of water over a landform.</li> </ul>	
		4.3 Concept 3 Water pollution is caused by point and non-point sources. <ul style="list-style-type: none"> <li>Determine the spread of pollution from point and nonpoint sources.</li> </ul>	

**ENVIRONMENTAL SUSTAINABILITY SYSTEMS STANDARD**

ESS.03. Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
ESS.03.01. Apply meteorology principles to environmental sustainability systems.		4.2 Concept 2 Soil structure and soil texture are elements that affect soil function.	
		<ul style="list-style-type: none"> <li>Quantify soil permeability to understand the relationship between soil particle size and rate of water filtration.</li> </ul>	
		4.1 Concept 3 Soil erosion results in the loss of quality soil and is a concern in the study of mineral soils. <ul style="list-style-type: none"> <li>Observe soil erosion caused by water.</li> </ul>	

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
ESS.03.02. Apply soil science and hydrology principles to environmental sustainability systems.		4.2 Concept 4 Soil horizons have varying structure, texture and color.	4.2 Concept 1 Soil is comprised of three different sized mineral particles; sand, silt, and clay.
		<ul style="list-style-type: none"> <li>Determine each horizon's texture, structure, and color within a soil profile.</li> </ul>	<ul style="list-style-type: none"> <li>Conduct tests to determine soil texture by feel.</li> </ul>

**ENVIRONMENTAL SUSTAINABILITY SYSTEMS STANDARD**

ESS.04. Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management and energy conservation).

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
ESS.04.04. Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental sustainability systems.		6.1 Concept 3 People depend on consumable forms of energy, such as fuel and electricity, which are used in everyday life.	6.1 Concept 2 Agricultural commodities can be converted to alternative energy sources.
		<ul style="list-style-type: none"> <li>• Measure electricity from various sources in a circuit.</li> <li>• Compare fuel consumption costs for agricultural production.</li> </ul>	<ul style="list-style-type: none"> <li>• Construct an educational display describing the relationship between agriculture and energy.</li> </ul>

**ENVIRONMENTAL SUSTAINABILITY SYSTEMS STANDARD**

ESS.05. Use tools, equipment, machinery and technology common to tasks in environmental service systems.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
ESS.05.02. Perform assessments of environmental conditions using equipment, machinery, and technology.		6.2 Concept 3 Agriculturalists use Global Positioning System (GPS) and Geographic Information System (GIS) to improve agricultural production efficiencies and environmental quality.	4.3 Concept 4 Ecologists determine a water's quality by measuring temperature, pH, turbidity, dissolved oxygen, and total dissolved solids (TDS).
		<ul style="list-style-type: none"> <li>• Collect soil data and record the GPS coordinates of each soil location.</li> <li>• Use the Web Soil Survey to research information on each soil location.</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluate water quality with sensors to quantify temperature, pH, turbidity, dissolved oxygen, and total dissolved solids.</li> <li>• Design an experiment determining drinking water quality.</li> <li>• Write a lab report explaining experimental findings.</li> </ul>

### FOOD PRODUCTS AND PROCESSING SYSTEMS STANDARD

FPP.01. Develop and implement procedures to ensure safety, sanitation and quality in food product and processing facilities.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPP 01.02. Apply food safety and quality assurance procedures in the harvesting, handling and processing of food products.		5.6 Concept 2 Food must be produced, transported, processed, and stored safely. <ul style="list-style-type: none"> <li>Examine microbial growth from cooked ground meat samples when refrigerated, stored at room temperature, and freshly cooked.</li> <li>Research the path a prepared food item takes through the food value chain and present their findings to the class.</li> </ul>	

### NATURAL RESOURCE SYSTEMS STANDARD

NRS.01. Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
NRS.01.01. Examine natural resource availability and ecosystem function in a particular region.	4.4 Concept 1 Energy flows from producers (plants) to consumers (animals). <ul style="list-style-type: none"> <li>Simulate the flow of energy in an ecosystem.</li> </ul>	4.4 Concept 3 Ecosystems are an interaction between organisms and the environment in which the organisms live. <ul style="list-style-type: none"> <li>Research an ecosystem.</li> <li>Develop a model and poster depicting the ecosystem they studied.</li> <li>Record key points of ecosystems presented by classmates.</li> </ul>	

### PLANT SYSTEMS STANDARD

PS.02. Apply principles of classification, plant anatomy, and plant physiology to plant production and management.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PS.02.02. Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.	5.2 Concept 1 Plants have roots, stems, leaves, and flowers, which are all vital to survival. <ul style="list-style-type: none"> <li>Identify and sketch the four basic plant parts.</li> <li>Describe the functions of plant parts.</li> </ul>	5.2 Concept 3 Flowers, consisting of four main parts, produce seeds for reproduction. <ul style="list-style-type: none"> <li>Construct a model depicting the parts of a complete flower.</li> </ul>	

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PS.02.03. Apply knowledge of plant physiology and energy conversion to plant systems.	5.2 Concept 4 Plants convert raw materials using the sun's energy into sugar and oxygen.	5.2 Concept 5 Plant cells use water, oxygen, and glucose to produce energy and metabolic by-products of carbon dioxide and water.	
	<ul style="list-style-type: none"> <li>Determine the presence of starch in plants that have received different light treatments.</li> </ul>	<ul style="list-style-type: none"> <li>Collect data on the rate of respiration and photosynthesis of plant leaves.</li> </ul>	

### PLANT SYSTEMS STANDARD

PS.03. Propagate, culture and harvest plants and plant products based on current industry standards.			
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PS.03.02. Develop and implement a management plan for plant production.	5.2 Concept 2 Seeds require moisture and warmth for germination.		
	<ul style="list-style-type: none"> <li>Conduct a germination trial to determine the germination rate of bean seeds.</li> </ul>		

### POWER, STRUCTURAL, AND TECHNICAL SYSTEMS STANDARD

PST.04. Plan, build and maintain AFNR structures.			
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PST.04.02. Determine structural requirements, specifications, customer needs, and estimate costs for AFNR structures.	6.3 Concept 2 The proper use of scale is important when drafting and designing project plans.		
	<ul style="list-style-type: none"> <li>Use proportions to solve problems and determine dimensions of objects drawn to scale.</li> <li>Read three-view plans of three-dimensional birdhouses to match to bird criteria.</li> </ul>		
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PST.04.04. Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout,	6.2 Concept 1 All property is legally defined and recorded based on a standardized regulatory system.	6.3 Concept 4 Agricultural projects involve planning, design, construction, implementation, and evaluation.	
	<ul style="list-style-type: none"> <li>Describe parcels of land using the rectangular survey system and the metes and bounds system.</li> </ul>	<ul style="list-style-type: none"> <li>Write step-by-step directions and cost for a project.</li> </ul>	

surveying, electrical, plumbing, concrete/masonry, etc.).		• Develop complete project plans including researching, sketching, writing directions, and estimating a bill of materials.	
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