

CTE Standards Unpacking
Fundamental Plant Science

Course: Fundamental Plant Science

Course Description: The plant science industry is a large part of the economic structure in South Dakota, from crop and forage production, to horticulture and forestry. Every corner of South Dakota is involved in the plant science field. In this course, students develop the necessary knowledge, skills, habits and attitudes for both entry-level employment and advancement in areas such as production agriculture, research, and horticulture, including the soft skills necessary to be successful. Topics covered in this course include plant anatomy and physiology, environmental impacts and plant growth, production and harvesting, and employability skills. Classroom and laboratory content may be enhanced by utilizing appropriate equipment and technology. Algebra, biology, English and human relations skills will be reinforced in the course. Fundamental Plant Science is reinforced through the FFA and Supervised Agricultural Experience (SAE) activities such as the Agronomy Career Development Event and related Proficiency Awards. Each student will be expected to maintain a SAE.

Career Cluster: Agriculture, Food and Natural Resources

Prerequisites: Recommended: Introduction to AFNR

Program of Study Application: Fundamental Plant Science is a first pathway course in the Agriculture, Food and Natural Resources Program of Study, Plant Systems pathway. Fundamental Plant Science is preceded by a Cluster course and would be followed by Advanced Plant Science (Agronomy) or Advanced Horticulture.

INDICATOR #PS 1: Explain principles of anatomy and physiology in plants.		
SUB-INDICATOR 1.1 (Webb Level: 1 Recall): Describe functional differences in plant structures including roots, stems, flowers, leaves, and fruits.		
SUB-INDICATOR 1.2 (Webb Level: 1 Recall): Classify and identify plants.		
Knowledge (Factual): -Identify plant parts and functions -Describe types of root systems -Identify plant growth stages -Describe respiration -Identify agricultural plants and their uses -Define plants as	Understand (Conceptual): -Understand the functional differences in plant structures	Do (Application): -Dissect a monocotyledon and dicotyledon -Demonstrate the absorption process -Model the transpiration and photosynthesis processes -Research major crops of South Dakota

<p>monocots or dicots</p> <p>-Define plants as annuals, biennials, or perennials</p> <p>-Identify common and noxious weeds</p> <p>-Describe growth characteristics of weeds</p>		
<p>Benchmarks: <i>Students will be assessed on their ability to:</i></p> <ul style="list-style-type: none"> • Compete in Land or Range Judging Contest. • Compete in Plant Range ID Contest. • Compete in the Agronomy CDE. • Prepare a presentation on a specific plant or crop in South Dakota identifying its parts, functions, growth stages, and uses. 		
<p>Academic Connections</p>		
<p>ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):</p> <p>English: 9-12 W.6 – Use technology, including the internet, to produce an individual writing product.</p> <p>Science: HS-LS2-5 – The role of photosynthesis</p>	<p>Sample Performance Task Aligned to the Academic Standard(s):</p> <p>-Research and report on a major crop of South Dakota.</p> <p>-Create a model of the photosynthesis process.</p> <p>-Complete a virtual lab on photosynthesis through Glencoe.com.</p>	

<p>INDICATOR #PS 2: Manipulate the environment to promote optimal growth in plants.</p>		
<p>SUB-INDICATOR 2.1 (Webb Level: 2 Skill/Concept): Determine nutritional requirements for optimal plant growth.</p>		
<p>SUB-INDICATOR 2.2 (Webb Level: 2 Skill/Concept): Examine data to evaluate and manage soil/media and nutrients.</p>		
<p>Knowledge (Factual):</p>	<p>Understand (Conceptual):</p>	<p>Do (Application):</p>

<ul style="list-style-type: none"> -Identify plant nutrient deficiency symptoms -Determine land use capability -Identify environmental factors that influence and optimize plant growth 	<ul style="list-style-type: none"> -The effects of water quality and conditions on plant growth 	<ul style="list-style-type: none"> -Experiment with plant growth regulators -Compare plant nutritional requirements -Illustrate the nitrogen cycle -Interpret tests of soil/media and/or plant tissue -Evaluate soil slopes, textures and structures -Experiment with soil/media permeability and water-holding capacity
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Benchmarks:

Students will be assessed on their ability to:

- Describe nutrient application methods and appropriate practices.
- Test soil/media and plant tissue for nutrient levels.
- Compete in Land and Home site Competition.

Academic Connections

<p>ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):</p> <p>Math:</p> <p>1) HSS.IC.B.6 - Evaluate reports based on data.</p> <p>2) HSF.IF.B.6 - Calculate and interpret the average rate of change of a function. Estimate the rate of change.</p> <p>Science:</p>	<p>Sample Performance Task Aligned to the Academic Standard(s):</p> <p>-Develop a soil treatment recommendation plan based on test results.</p> <p>-Use slope to determine land classification.</p>
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HS-ESS-2-1 – Analyze geoscience data to make the claim that one change to Earth's surface can create feedback that cause changes to other Earth systems.	-Evaluate a variety of soil profiles and record observations.
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INDICATOR #PS 3: Evaluate fundamentals of production and harvesting of plants.		
SUB-INDICATOR 3.1 (Webb Level: 2 Skill/Concept): Analyze a production plan for optimal plant production.		
SUB-INDICATOR 3.2 (Webb Level: 2 Skill/Concept): Compare the basic methods for reproducing and propagating plants.		
SUB-INDICATOR 3.3 (Webb Level: 2 Skill/Concept): Examine fundamentals to harvest, handle, store, and market crops.		
Knowledge (Factual): -Identify factors affecting crop selection -Identify technology and equipment used in plant production -Identify methods of vegetative reproduction -Examine methods of plant pollination (e.g. natural, manipulated, etc.) -Distinguish between the components and functions of plant reproductive parts -Identify agronomic, horticultural, specialty crops	Understand (Conceptual): -Understand plant production plans for different species	Do (Application): -Examine methods of seeding -Investigate sustainable and conventional methods of pest and weed management -Experiment with plant germination rate factors -Examine forage and crop maturity -Research methods of forages and crop harvesting (e.g. combining, silage, haylage, haying, etc.) -Monitor forage and crop quality in storage
Benchmarks:		

Students will be assessed on their ability to:

- Complete Private Pesticide Applicator Certification training.
- Compare methods for seedbed preparation.
- Compare conventional, reduced-tillage and no-till concepts.
- Compare methods of asexual/sexual plant propagation (e.g. cuttings, air layering, grafting, etc.).
- Compare forage and crop storage facilities.

Academic Connections

ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):	Sample Performance Task Aligned to the Academic Standard(s):
<p>English: 9-12 W.6 – Use technology, including the internet, to produce an individual writing product.</p> <p>Science: HS-LS4-3 – Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.</p>	<p>-Research methods of forages and crop harvesting (e.g. combining, silage, haylage, haying, etc.).</p> <p>-Students will compare and contrast seed varieties to determine which traits allow for the best yields, based on harvest data.</p>

INDICATOR #PS 4: Explore employability skills within the plant science industry.

SUB-INDICATOR 4.1 (Webb Level: 2 Skill/Concept): Develop soft skills to enhance employability.

Knowledge (Factual):	Understand (Conceptual):	Do (Application):
<ul style="list-style-type: none"> -Identify plant science related careers -Recognize non-verbal communication signals -Identify ways to handle conflict 	<ul style="list-style-type: none"> -Understand plant system Career pathways -Understand plant system career educational requirements -Understand the employability skills of the plant science industry 	<ul style="list-style-type: none"> -Demonstrate proper communication skills -Compose a cover letter, resume, and follow-up letter -Fill out a job application -Complete a job interview

Benchmarks:

Students will be assessed on their ability to:

- Create an SAE project.
- Work as a team to solve problems.

Academic Connections

ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):	Sample Performance Task Aligned to the Academic Standard(s):
<p>English:</p> <p>1) 9-12 W.2 – Write to inform</p> <p>2) 9-12 W.6 – Use technology, including the internet, to produce an individual writing product.</p>	<p>-Compose a cover letter, resume, and follow-up letter.</p> <p>-Research job opportunities within the plant systems pathway.</p>

Additional Resources

- Plant Science lessons (Middle School Food and Agricultural Literacy Curriculum: Educators Resources in ffa.org)
- Agricultural Science and Technology lessons (Middle School Food and Agricultural Literacy Curriculum: Educators Resources in ffa.org)
- MyCAERT Curriculum
- Cengage Introduction to Agronomy, Food, Crops, and Environment textbook
- Plant & Soil Science: Fundamentals and Applications by Rick Parker (Delmar Cengage Learning)
- Principles of Agriculture, Food, and Natural Resources by Rayfield, Smith, Park, and Croom (Goodheart-Wilcox Publisher)
- Curriculum for Agricultural Science Education: Principles of Agricultural Science-Plant
- Curriculum for Agricultural Science Education: Animal and Plant Biotechnology
- Unleashing a Decade of Innovation in Plant Science: A Vision for 2015-2025 (www.plantsummit.files.wordpress.com)
- South Dakota Soybean Interactive Curriculum: http://www.vivayicsolutions.com/063-SDSoy&PC/16-01SoyInteractive/Gold/story_html5.html
- Communities of Practice: Horticulture/Greenhouse Management (<https://communities.naae.org/community/instruction/horticulture>)