south dakota DEPARTMENT OF EDUCATION
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CTE Standards Unpacking
Fundamental Ag Mechanical Technologies

Course: Fundamental Ag Mechanical Technologies
Course Description: Fundamental Ag Mechanical Technologies is offered to help students build basic knowledge and skills in the area of agricultural mechanics, along with soft skills necessary for careers in the Agriculture, Food and Natural Resources sector. Topics covered in this course include: electricity, engines and ag technology. More substantial knowledge on the individual topics comes in advanced courses such as Ag Systems Technology, Ag Metal Fabrication, and Fundamental Ag Structures. Classroom and laboratory content may be enhanced by utilizing appropriate equipment and technology. Algebra, geometry, English and human relation skills will be reinforced in the course. Work-based learning strategies appropriate for this course are school-based enterprises and field trips. This class is reinforced through the FFA and Supervised Agricultural Experience (SAE) programs, the Ag Mechanics Career Development Event, and related Proficiency Experience or Internship Project. 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 Ag Mechanical Technologies is a first pathway course in the Agriculture, Food and Natural Resources Program of Study, Power Systems pathway. Fundamental Ag Mechanical Technologies is preceded by a Cluster course and is recommended to be taken prior to participation in Ag Systems Technology or Ag Metal Fabrication.

<table>
<tr><td colspan="3">INDICATOR #FAM 1: Apply safety practices in mechanical applications.</td></tr>
<tr><td colspan="3">SUB-INDICATOR 1.1 (Webb Level: 2 Skill/Concept): Explain the safe operation and servicing of machinery and equipment.</td></tr>
<tr><td colspan="3">SUB-INDICATOR 1.2 (Webb Level: 3 Strategic Thinking): Demonstrate safe operation of construction/fabrication tools.</td></tr>
<tr><td>Knowledge (Factual):
-Operation of machinery, equipment, and tools

-Safety procedures for machinery, equipment, and tools</td><td>Understand (Conceptual):
-Importance of proper safety protocol

-Safe operation practices for construction/fabrication

-Preventative strategies for safe workplaces</td><td>Do (Application):
-Complete OSHA 10-hour Safety Certification

-Operate equipment and tools to perform a given task

-Applying safety concepts</td></tr>
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Benchmarks:
Students will be assessed on their ability to:

- Demonstrate welding and electrical safety.
- Demonstrate shop safety (first aid, fire extinguisher).
- Demonstrate equipment and machinery safety .
- Perform pre-operation inspections.
- Compare and contrast lubrication and fluid viscosity.
- Classify and identify tools.
- Apply safe operation of cordless tools.
- Apply safe operation of power tools.
- Assess the proper safety procedures for using machinery, equipment and tools.
- Investigate accidental case studies to determine safety violations.

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):**
English: 1) 9-12 SL.4 - Presenting information, findings, and evidence conveying a clear perspective.	-Students present safety procedures on a given tool or equipment.

INDICATOR #FAM 2: **Identify maintenance procedures & schedules for mechanical equipment, power and agricultural technology.**

SUB-INDICATOR 2.1 (Webb Level: 2 Skill/Concept): Identify parts and explain functions of various mechanical systems.

SUB-INDICATOR 2.2 (Webb Level: 2 Skill/Concept): Investigate common maintenance schedules and practices for equipment.

SUB-INDICATOR 2.3 (Webb Level: 3 Strategic Thinking): Troubleshoot problems in mechanical systems.

Knowledge (Factual):	**Understand (Conceptual):**	**Do (Application):**
-Maintenance procedures for mechanical equipment, power and ag technology -Parts of mechanical systems -Reading a maintenance manual for equipment	-To conduct maintenance in a safe and efficient manner. -Ensure effective implementation and control of maintenance activities. -Ability to identify a problem and develop a solution.	-Lubricate machinery and equipment -Perform machine adjustments (belts, chain drives, sprockets, etc.) -Participate in the Ag Mechanics CDE

Benchmarks:
Students will be assessed on their ability to:

- Create a model hydraulic system.
- Create a model pneumatic system.
- Compare and contrast exhaust systems.
- Identify and explain functions of internal combustion engine components.
- Demonstrate proper disposal of waste products.
- Design a preventative maintenance schedule (tire rotation, oil changes, check fluid levels, etc.).
- Assess parts for replacement.
- Select, calibrate, and use measuring and testing devices.
- Select the correct tools or materials for the job at hand.
- Analyze problems and develop solutions for mechanical systems.

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):**
Math: 1) HSG.MG.A.1 - Use geometric shapes, their measures, and their properties to describe objects	-Create a model of a hydraulic or pneumatic system.
2)HSN.Q.A.3 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	-Select, calibrate, and use measuring and testing devices

INDICATOR #FAM 3: **Demonstrate basic skills in project planning and metal fabrication.**

SUB-INDICATOR 3.1 (Webb Level: 3 Strategic Thinking): Create sketches of metal projects.

SUB-INDICATOR 3.2 (Webb Level: 2 Skill/Concept): Demonstrate basic welding principles and techniques.

SUB-INDICATOR 3.3 (Webb Level: 3 Strategic Thinking): Employ metal fabrication principles to create a metal project.

Knowledge (Factual):	**Understand (Conceptual):**	**Do (Application):**
-Drawing scale representations	-Welding and fabrication techniques.	-Create a metal project from a sketch using different welding techniques
-Welding and metal fabrication principles	-Relationship between sketch model and the final	-Draw a sketch to scale

-Using geometric shapes to draw a sketch -Knowledge of metal properties and use in ag	product -Compare possible metals to use for a project based on their properties	and create a project

Benchmarks:
Students will be assessed on their ability to:

- Draw a scale representation of a metal project.
- Create a list of materials for a metal project.
- Develop a bill of materials for a metal project.
- Bend, cut, shape, and grind metal.
- Identify welders and controls.
- Prepare metal for welding.
- Perform various welding positions and welding joints.
- Demonstrate welding positions.

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):**
Math: 1) HSG.CO.D.12 - Make formal geometric constructions with a variety of tools and methods 2) HSG.MG.A.1 - Use geometric shapes, their measures, and their properties to describe objects	-Sketch a metal project using various measurement techniques. Create a metal project from the sketch using different welding techniques. -Draw a scale representation of a metal project.

INDICATOR #FAM 4: **Apply electrical principles in agricultural applications.**

SUB-INDICATOR 4.1 (Webb Level: 1 Recall): Recognize the components and functions of electrical systems.

SUB-INDICATOR 4.2 (Webb Level: 3 Strategic Thinking): Demonstrate fundamental principles of electricity.

Knowledge (Factual):	**Understand (Conceptual):**	**Do (Application):**
-Components of electrical systems -Ohm's Law	-Relationship of electrical components -Importance of following electrical codes to wire an	-Calculate voltage drop for electrical equipment -Wire a wall for two-way or three-way circuits

-Relationship between voltage and amps -Wire codes	electrical system	-Troubleshoot an electrical system to identify performance problems

Benchmarks:
Students will be assessed on their ability to:

- Identify electrical safety equipment.
- Use volt and amp meters.
- Identify classes of wire.
- Select the proper wire, wire nuts, junction boxes, switches, outlets, for a circuit.
- Recognize electrical systems.
- Interpret wire code regulations.
- Describe techniques for grounding.
- Determine circuit protection requirements.
- Wiring a circuit for a light controlled by a switch.
- Interpret schematic drawings for an electrical system.

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):**
Science: 1) HS-PS3-4 - Plan and carry out an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution	-Wiring a circuit for a light controlled by a switch

INDICATOR #FAM 5: **Investigate emerging agricultural technologies.**

SUB-INDICATOR 5.1 (Webb Level: 2 Skill/Concept): Investigate new and/or existing technology in agriculture.

Knowledge (Factual):	**Understand (Conceptual):**	**Do (Application):**
-GPS and GIS use in the	-Advantages of agricultural	-Use drones to map a

agriculture industry -Precision agriculture practices	technology	field -Use precision ag technology to make management decisions for a farm

Benchmarks:
Students will be assessed on their ability to:

- Discuss GPS use in machinery.
- Discuss GIS use in the agriculture industry.
- Research robotic applications in agriculture (robotic welders, milkers, farm equipment sensors).
- Compare and contrast agricultural technologies in new and existing systems.

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):**
English: 1) 9-12 W.6 – Use technology, including the internet, to produce an individual writing product.	-Write a report on the agricultural technologies in new and existing system

INDICATOR #FAM 6: **Develop employability skills related to the Power, Structural, and Technical Systems Pathway.**

SUB-INDICATOR 6.1 (Webb Level: 2 Skill/Concept): Develop soft skills to enhance employability.

Knowledge (Factual):	**Understand (Conceptual):**	**Do (Application):**
-Proper communication skills	-Importance of employability skills in careers -Differentiate appropriate behaviors between work(formal) and informal environments	-Job shadow -Tour industry

Benchmarks:
Students will be assessed on their ability to:

- Perform a mock interview.
- Create professional questions for an industry tour.
- Compose a cover letter and resume.

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):**
English: 1) 9-12 SL.1 - Participate in collaborative discussion	-Perform a mock interview.

Additional Resources
OSHA Safety Certification
National Career Readiness Certification
Communities of Practice
Ag Education Discussion Lab
Ag Mechanics CDE
Job Interview CDE
Ag Sales CDE
Star in Ag Business
Ag Mechanics Fabrication and Design E/P
Ag Mechanics Repair and Maintenance E/P
http://quizlet.com – search tools and safety
Smithsonian Motor Works Engines
Quizlet- Tool ID Flashcards
Modern Marvels: Saws
Modern Marvels: Hydraulics
Read a ruler (www.rulergame.net)
www.sketchup.com
Job shadow an electrician
Modern Marvels: Electricity
Modern Marvels: Wiring America
Google Earth
Farming Simulator 17
AgExplorer
National Career Readiness Certification


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