Agriscience Course Standards with Aligned Activities

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	Standard Description	*Activity Description
1	Synthesize research on the historical importance and purpose of agriculture and agriculture organizations, identifying major events, opportunities and technological developments influenced by Agriscience theories and practices.	Have each student research a different event in the National FFA History write an explanatory essay, citing at least 3 sources in an annotated bibliography, about how the event impacted the FFA Organization, and/or American Agriculture. Students will orally present their research in chronological order to the class.
2	Review common laboratory safety procedures for tool and equipment operation in the agricultural and biosystems engineering laboratories, including but not limited to accident prevention and control procedures. Demonstrate the ability to follow safety and operational procedures in a lab setting and complete a safety test with 100 percent accuracy.	Divide the class into groups of two students to do a safety inspection of the agriculture laboratories including all tools and equipment. Have the students develop a written safety inspection report of their findings and include recommendations to correct any safety issues and present their findings to the class for discussion.
3	Gather and analyze information from multiple authoritative sources, such as the United States Bureau of Labor Statistics, United States Department of Agriculture website and Tennessee labor data, to summarize the economic impact of the agricultural industry. Describe major career trends in Tennessee, the United States, and worldwide.	Have students choose a career in agriculture that is interesting to them and research the profession. Have students write an informative essay on a job title including the type of work, skills, knowledge requirements, job availability, and average salary in their field of work, citing 3 courses of labor data, charts, or graphs to support text. The text should answer the question: why it is important to the agriculture industry as a whole. Have the student orally summarize their findings to the class.
4	Determine how a Supervised Agricultural Experience (SAE) program functions as a method to apply concepts of the scientific investigation process (i.e. conducting an Agriscience Fair project). Compare and contrast the types of SAEs as related to their importance to the scientific investigation process.	Once students have decided on an SAE program, have the students determine a goal for their SAE program, hypothesize an outcome in a narrative text, apply the concepts of the scientific investigation process as a method to evaluate the outcome, and cite specific textual evidence to support analysis. Have students further their research by developing and conducting an Agriscience Fair project. For more information on the scientific process, review TN Biology standards.

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5	Conduct a research project or literature review exploring a specific social and/or political impact on the agriculture industry at the local, state, national, or international level. For example, explore how the increase in availability of genetically modified organisms has impacted crop production and the green movement. Summarize findings in an informative essay. Revise, edit or rewrite as needed to strengthen writing.	Write an informative essay, citing multiple sources in an annotated bibliography, to compare and contrast current issues in breeding and genetics Compare natural selection versus genetic modification versus selective breeding and the economic, ethical, and agricultural impact associated with these processes. Have students revise, edit, and rewrite their essay before orally presenting their research.
6	Describe the biogeochemical cycles impacting the agriculture industry by creating illustrative models and informative texts for the following: Carbon Cycle Nitrogen Cycle Oxygen Cycle Water Cycle	Divide classroom into groups and assign each group a biochemical cycle to research, citing at least 3 references, and prepare an illustrative model and informative text that explains the steps, functions, and purpose of their cycle to present to their classmates as a group presentation.
7	Critique the dynamics of biomass and energy flow in ecosystems by analyzing the major components of a food chain. Analyze the structure of the relationships among the concepts of carrying capacity, species populations, and organism interactions within multiple ecosystems and natural habitats.	Have students to visit a local or state park or natural area to catalog the observable biotic and abiotic factors, plant and animal populations, producer, consumers, decomposers, etc. Have students present an informative report including collected information, drawings and pictures taken to document findings from their visit.
8	Produce an informative essay to distinguish between types of pollution and their sources, defining and applying ecology- and conservation-specific terminology. Compare and contrast important connections between pollution and its effects on environment.	Create different scenarios where pollution could occur (Ex: Farmer's applying chemicals, factory or machine exhaust, waste products being removed, etc.) and have students research laws and conservation practices, citing multiple sources, that are in place to prevent these common causes of pollution.
9	Compare basic plant and animal cell biology, including structure and function. Create a visual representation that identifies cellular organelles and major cell processes.	After researching cell organelles and their functions have students create models with all the organelles properly labeled and explain their function within the cell. Some examples of construction materials could be: play-doh, household items, food/candy.

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10	Compare and contrast the roles of proteins, carbohydrates, lipids, and nucleic acids as they relate to cell growth and cell reproduction.	Have students design a graphic organizer to compare and contrast proteins, carbohydrates, lipids, and nucleic acid, citing textual evidence. Conduct a lab to detect their presence in certain foods and record findings in their notebook.
11	Determine the significance of and relationships between genes, chromosomes, proteins, and hereditary traits. Analyze the role of genes in determining genetic make-up, gender, and hereditary characteristics. Using systems of equations, explain the variation and distribution of genotypes and phenotypes expressed in plants and animals.	After properly covering the Punnett Square and its function, students will research, citing at least 3 sources, and prepare an informative text explaining genetic characteristics associated with cattle. Have students interpret an Expected Progeny Difference chart (EPDs) and discuss the genetic information listed and its benefit to potential buyers and breeders. Students may then use these genetic qualities outlined in the EPDs and integrate them into a Punnett Square model to determine genetic ratios of certain traits.
12	Using graphic illustrations and supporting text, identify and describe major animal body systems (skeletal, muscular, respiratory, digestive, nervous, circulatory, respiratory, and reproductive) to establish a basic knowledge of their purpose, structure, and function.	Divide students into groups and assign them an animal body system. Have groups research each system and teach the class what they have learned about the purpose, structure, and function of the system through a group presentation.
13	Classify the types of digestive systems in domestic animals, and compare and contrast their anatomical and physiological differences. Synthesize research on animal nutrition (using academic journals or publications from Tennessee Extension Service) to produce an informative narrative, including defining and applying nutrition specific terminology, to examine the stages of digestion and associated processes.	Use play-doh, or other modeling material, to map out the digestive systems in domestic animals to compare and contrast monogastric and polygastric digestive systems. Use pins to label the different parts.
14	Use the periodic table and the atomic chart to compare differences between ionic and covalent bonding as related to digestion. Demonstrate an understanding of the interdependence of the complex chemical and biological processes involved in the digestion process including, but not limited to, the following: elements, compounds, mixtures, and acids.	Review the elements, compounds, mixtures, acids, bases, the periodic table and atomic chart as a class. Compare and contrast ionic and covalent bonds and determine the role that chemical bonding plays in animal digestion, citing textual evidence.

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15	Research the relationship between metabolism, energy, and nutrition. Evaluate life stage and activity level to determine the nutritional needs of animals. Differentiate types of rations to maximize animal performance.	Interview or invite an animal nutritionist to speak to the class on the importance of nutrition based on life stage and activity level. Drawing from informative texts and the animal nutritionist's comments, write a report on how an animal's health affects their metabolism, digestion, and energy production, citing textual evidence.
16	Apply concepts related to the basic cellular and biochemical processes in plants to demonstrate the following: a. Create a graphic illustration of the parts and functions of plant cells b. Use quantitative reasoning to balance chemical equations related to plant processes c. Interpret the role of physics within the cohesion-tension theory and its significance to plant life d. Examine the roles of photopigments and the effects of different colors of light on plant growth	Working with your schools biology teacher, attain or prepare slides of a monocot and dicot root, stem, and leaf sample for a plant anatomy lab. While viewing the slides, have students draw what they see, label all major parts, and identify their functions.
17	Formulate a hypothesis about the correlation between plant nutrient deficiencies and soil composition. Conduct basic soil analysis to determine the chemical elements and nutritional levels available in soils essential for plant growth. Draw conclusions about the ability of soils to meet the nutritional requirements of plants.	Conduct a soil lab where students analyze different soil samples to determine and record the physical characteristics of the soil (fine, medium, course, clay, sand, silt, etc.) in a graphic illustration. Research the yield rates, limitations, and practices associated with their soil samples and present a written recommendation for the best use of the soil to the class.
18	Research and develop illustrative models that compare and contrast the reproductive structures of plants, drawing out key differences between sexual and asexual reproduction processes.	Have students create a graphic organizer comparing and contrasting sexual and asexual reproduction and include plant examples for each reproductive process. These could be posted in the room for a gallery walk to allow students to review/clarify work through peer discussion.

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19	Describe the structure and function of different seed components and summarize their roles in plant reproduction and propagation.	Prior to learning about the seed parts and plant growth of monocot and dicot plants, have students plant several corn and bean seeds and document the growth in a journal. Have students identify the cotyledon, hypocotyl, coleoptile, and true leaves as the plant is emerging, as well as measure growth and development of the plants and root systems. Chart the results at the end.
20	Describe the structures and functions of the male and female animal reproductive systems. Compare and contrast the differences of the reproductive systems between small and large animal species.	Develop graphical illustrations to map out the male and female reproductive system in animals. Use pins to label the different parts and develop a key that explains the functions of each part identified.
21	Apply fundamental principles of physics as they relate to agricultural power and technology concepts in order to demonstrate the following: a. Analyze the relationship between speed, distance, and time b. Relate the types of simple machines to the law of machines and mechanical advantages c. Specify groups, sources, and forms of energy d. Analyze the principle of heat energy and describe the way heat travels e. Explain the law of conservation of energy f. Explain the production of energy and relate it to the invisible light spectrum	After teaching the lesson on the relationship between speed, distance, and time, have the students to develop a hieroglyphics moment to help them remember parts of the mathematical equations to determine mechanical horsepower to operate a variety of simple machines. (A hieroglyphic moment is to have the students to divide a blank sheet of paper into six sections and write the different mathematical components at the top of each section such as: speed, distance, time, energy, power and watts.) Have students share and explain how the picture or icon relates to each mathematical topic. Have students solve several different equations to calculate horsepower problems with or without hieroglyphic moments.
22	Identify different methods by which electrical energy can be produced. Discuss the safety hazards involved in each method as well as prevention and control methods relevant to electrical power supplies. Justify the use of different precautions for the prevention or management of electrical hazards and evaluate the efficiency of the prevention measures.	Divide students into groups according to the different methods for producing electrical energy. Have students to brainstorm and develop a list of safety hazards and how prevention or control methods prevent injury for their method. Have students research multiple resources and use their original list to justify the use of different precautions for the prevention or control of electrical hazards and present their findings to the class.

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23	Utilize the appropriate instruments needed to calculate and measure voltage, amperage, resistance, and wattage. (TN CCSS Reading 3; TN CCSS Math N-Q; TN Physical World Concepts 4; TN Physics 5)	In groups, have students gather relevant information from multiple sources to develop a "User Guide for Dummy's" for instruments used to measure voltage, amperage, resistance and wattage. Have the students exchange guides to build additional clarification to increase the accuracy of the guide.
24	Apply basic principles of thermodynamics to analyze the function of major components of gasoline and diesel fuel engines.	After defining the first law of thermodynamics and identifying the cycles and major parts of the engine, have students develop their own theory of how each part of a gasoline and diesel engine relates to the first law of thermodynamics. Then group the students into groups of four to compare theories to develop a group theory for a gas or diesel engine. Post the group theories on the wall to do a gallery walk to build on each group's theory. In a class discussion, have students explain why their additions helped to explain the first law of thermodynamics.
25	Using quantitative reasoning and employing appropriate unit conversions, calculate horsepower and thermal efficiency in internal combustion engines by creating systems of equations that describe numerical relationships.	After teaching the method to calculate horsepower, thermal efficiency, and the uses of simple machines, divide students into groups to determine what formula to use for given scenarios. Example: How much force or horsepower is required to move a 70 pound bale of hay up a hay elevator into the barn loft that is 12 feet high? Note: change the weight, item, and equipment that is used within your program or community.