



AGRISCIENCE 01.0000.00

EMBEDDED SCIENCE CREDIT CROSSWALK

The AgriScience program has been recognized by the Arizona State Board of Career and Technical Education (CTE) as being eligible for consideration by local governing boards to grant 1 credit of science. This document is the result of committee analysis in 2019.

Note: AZ high school science standards are highlighted.

STANDARD 1.0 EXAMINE THE NATURE, SCOPE, AND ROLE OF AGRICULTURE IN THE SOCIETY AND THE ECONOMY

1.1 Investigate the impact of the agricultural industry on population, food, energy, and environment

Chemistry HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

Earth and Space HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.E1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

PLUS HS+E.E1U3.10 Ask questions, define problems, and evaluate a solution to a complex problem, based on prioritized criteria and tradeoffs, that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

PLUS HS+E.E1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Rationale: Analyze the impacts of chemistry technologies. Evaluate how natural resources and hazards influence society.

1.2 Investigate the economic importance of products obtained from agriculture (i.e., animals, plants, technology, mechanics, etc.)

Chemistry HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

Rationale: Discuss how sustainability balances environmental, economic, and social equity.

1.3 Examine how a stable agricultural sector supports a nation of food security

1.4 Differentiate between agricultural imports and exports

1.5 Examine the benefit of earning foreign exchange through the export of agricultural products

1.6 Investigate how the agriculture sector provides employment opportunities to the labor force

STANDARD 2.0 EXAMINE THE IMPACT OF TRENDS, TECHNOLOGIES, AND POLICIES ON AGRICULTURE

2.1 Identify the major milestones and technological advancements on agriculture and the impact to society (e.g., advances in mechanization, quality seed and selective breeding, improved resource management, and higher quantity of food)

Earth and Space HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.E1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

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PLUS HS+E.E1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Life Science HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

HS.L4U1.27 Obtain, evaluate, and communicate evidence that describes how changes in frequency of inherited traits in a population can lead to biological diversity.

Rationale: Study agriculture milestones over time.

2.2 Describe the effects of genetic modification on agricultural production

Life Science HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

HS.L3U1.24 Construct an explanation of how the process of sexual reproduction contributes to genetic variation.

HS.L3U3.26 Engage in argument from evidence regarding the ethical, social, economic, and/or political implications of a current genetic technology.

HS.L4U1.27 Obtain, evaluate, and communicate evidence that describes how changes in frequency of inherited traits in a population can lead to biological diversity.

Rationale: Discuss the pros and cons of GMOs as well as public perceptions. Investigate the role of biotechnology.

2.3 Describe the effects of current farming methods on water resources, erosion, and soil fertility

Earth and Space HS.E1U1.11 Analyze and interpret data to determine how energy from the Sun affects weather patterns and climate.

HS.E1U1.12 Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).

HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.E1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

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Life Science HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

Rationale: Study erosion (soil and water unit). Investigate plant production and sustainability.

2.4 Explain the effects of pesticides and fertilizers on water and the environment

Earth and Space HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.E1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

PLUS HS+E.E1U3.10 Ask questions, define problems, and evaluate a solution to a complex problem, based on prioritized criteria and tradeoffs, that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

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Life Science HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

Rationale: Study pesticides and Integrated Pest Management (IPM).

2.5 Explain how legislation affects agricultural production (i.e., environmental, workforce, marketing, trade, animal welfare, biosecurity, taxes, water, etc.)

Chemistry HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

Physics HS.P4U3.9 Engage in argument from evidence regarding the ethical, social, economic, and/or political benefits and liabilities of energy usage and transfer.

Earth and Space HS.E1U1.11 Analyze and interpret data to determine how energy from the Sun affects weather patterns and climate.

Life Science HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

HS.L1U3.23 Obtain, evaluate, and communicate the ethical, social, economic and/or political implications of the detection and treatment of abnormal cell function.

HS.L3U3.26 Engage in argument from evidence regarding the ethical, social, economic, and/or political implications of a current genetic technology.

Rationale: Discuss agricultural ethic issues.

2.6 Analyze the impact of biotechnology on production, processing, storage, and preparation of food, fiber, and pharmaceuticals

Life Science HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

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HS.L3U1.24 Construct an explanation of how the process of sexual reproduction contributes to genetic variation.

HS.L3U1.25 Obtain, evaluate, and communicate information about the causes and implications of DNA mutation.

HS.L3U3.26 Engage in argument from evidence regarding the ethical, social, economic, and/or political implications of a current genetic technology.

HS.L4U1.27 Obtain, evaluate, and communicate evidence that describes how changes in frequency of inherited traits in a population can lead to biological diversity.

Rationale: Biotechnology

- 2.7 Use scientific evidence to investigate controversial topics and make educated decisions (i.e., environmental issues, climate change, genetic engineering, soil degradation, etc.)

Earth and Space HS.E1U1.11 Analyze and interpret data to determine how energy from the Sun affects weather patterns and climate.

HS.E1U1.12 Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).

HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

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HS.L4U1.27 Obtain, evaluate, and communicate evidence that describes how changes in frequency of inherited traits in a population can lead to biological diversity.

HS.L4U1.28 Gather, evaluate, and communicate multiple lines of empirical evidence to explain the mechanisms of biological evolution.

Rationale: Evaluate agricultural issues, biotechnology, and environmental impact.

- 2.8 Investigate the use of data to solve problems in agricultural systems (i.e., geographic, economic, demographic, etc.)

Earth and Space HS.E1U1.12 Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).

HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

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PLUS HS+E.E1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Life Science HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

Rationale: Study sustainability and agricultural issues.

STANDARD 3.0 EXAMINE THE USE OF SCIENTIFIC PROCESSES USED IN AGRICULTURE

The following science standards apply to 3.1 – 3.9

Biology PLUS HS+B.L1U1.4 Develop and use models to explain the interdependency and interactions between cellular organelles.

PLUS HS+B.L1U1.5 Analyze and interpret data that demonstrates the relationship between cellular function and the diversity of protein functions.

PLUS HS+B.L1U1.6 Develop and use models to show how transport mechanisms function in cells.

PLUS HS+B.L1U1.7 Develop and use models to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (plant and animal).
HS.E1U1.11 Earth and Space Analyze and interpret data to determine how energy from the Sun affects weather patterns and climate.

Chemistry HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.
HS.E1U1.12 Earth and Space Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).

Earth and Space HS.E1U1.11 Analyze and interpret data to determine how energy from the Sun affects weather patterns and climate.

HS.E1U1.12 Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).

HS.E1U1.13 Evaluate explanations and theories about the role of energy and matter in geologic changes over time.

HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.E1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

PLUS HS+E.E1U3.10 Ask questions, define problems, and evaluate a solution to a complex problem, based on prioritized criteria and tradeoffs, that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

PLUS HS+E.E1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Life Science HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

HS.L2U1.19 Develop and use models that show how changes in the transfer of matter and energy within an ecosystem and interactions between species may affect organisms and their environment.

HS.L1U1.20 Ask questions and/or make predictions based on observations and evidence to demonstrate how cellular organization, structure, and function allow organisms to maintain homeostasis

HS.L1U1.21 Obtain, evaluate, and communicate data showing the relationship of photosynthesis and cellular respiration; flow of energy and cycling of matter.

HS.L1U1.22 Construct an explanation for how cellular division (mitosis) is the process by which organisms grow and maintain complex, interconnected systems.

HS.L1U3.23 Obtain, evaluate, and communicate the ethical, social, economic and/or political implications of the detection and treatment of abnormal cell function.

HS.L3U1.24 Construct an explanation of how the process of sexual reproduction contributes to genetic variation.

HS.L3U1.25 Obtain, evaluate, and communicate information about the causes and implications of DNA mutation.

HS.L3U3.26 Engage in argument from evidence regarding the ethical, social, economic, and/or political implications of a current genetic technology.

HS.L4U1.27 Obtain, evaluate, and communicate evidence that describes how changes in frequency of inherited traits in a population can lead to biological diversity.

HS.L4U1.28 Gather, evaluate, and communicate multiple lines of empirical evidence to explain the mechanisms of biological evolution.

Physics HS.P4U3.9 Engage in argument from evidence regarding the ethical, social, economic, and/or political benefits and liabilities of energy usage and transfer.

Rationale: Use a systematic, evidence-based process to acquire new knowledge, understand natural phenomena, and solve problems through observation, experimentation, and analysis.

- 3.1 Identify research methods used in agriculture
- 3.2 Describe and demonstrate the scientific process
- 3.3 Formulate predictions, questions, and hypotheses
- 3.4 Evaluate appropriate resources for research
- 3.5 Demonstrate safe practices in the laboratory, classroom, and work situations
- 3.6 Design and conduct scientific investigations
- 3.7 Record observations, notes, sketches, questions, and ideas during an investigation
- 3.8 Generate data tables, charts, and graphs based on collected data
- 3.9 Analyze data, communicate results, conclusions, and propose further investigations

STANDARD 4.0 EXAMINE THE RELATIONSHIP OF THE ENVIRONMENT TO AGRICULTURE PRODUCTION AND SUSTAINABILITY

- 4.1 Identify agricultural products that can be converted to alternative energy sources

Chemistry HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

Earth and Space HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.E1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

PLUS HS+E.E1U3.10 Ask questions, define problems, and evaluate a solution to a complex problem, based on prioritized criteria and tradeoffs, that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

PLUS HS+E.E1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Rationale: Agricultural products and waste materials are widely used as renewable biomass feedstocks to produce biofuels, electricity, and heating. These materials are converted through various processes (i.e., fermentation, transesterification, anaerobic digestion, etc.).

4.2 Analyze the use of renewable energy sources in agriculture (i.e., wind, solar, biofuels, etc.)

Chemistry HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

Earth and Space HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.E1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

PLUS HS+E.E1U3.10 Ask questions, define problems, and evaluate a solution to a complex problem, based on prioritized criteria and tradeoffs, that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

PLUS HS+E.E1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Physics HS.P4U3.9 Engage in argument from evidence regarding the ethical, social, economic, and/or political benefits and liabilities of energy usage and transfer.

Rationale: Review how renewable energy powers on-farm operations (i.e., irrigation, heating, etc.) and results in additional income.

4.3 Compare and contrast production practices with regard to efficiency, sustainability, and economic viability (i.e., organic, naturally raised systems, conventional agricultural production, etc.)

Earth and Space HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.E1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

PLUS HS+E.E1U3.10 Ask questions, define problems, and evaluate a solution to a complex problem, based on prioritized criteria and tradeoffs, that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

PLUS HS+E.E1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Life Science HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

Rationale: Compare technologies that reduce fossil fuel dependence and enhance sustainability (i.e., photovoltaics, wind turbines, anaerobic digesters, etc.).

4.4 Investigate how alternative production systems affect production and environment (i.e., aquaculture, vertical farming, GPS plotting, seed spacing, etc.)

Earth and Space HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.E1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

PLUS HS+E.E1U3.10 Ask questions, define problems, and evaluate a solution to a complex problem, based on prioritized criteria and tradeoffs, that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

PLUS HS+E.E1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Rationale: Study sustainability and water unit.

4.5 Identify municipal, industrial, and agricultural sources and uses of water

Chemistry HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

Earth and Space HS.E1U1.11 Analyze and interpret data to determine how energy from the Sun affects weather patterns and climate.

HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.E1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

PLUS HS+E.E1U3.10 Ask questions, define problems, and evaluate a solution to a complex problem, based on prioritized criteria and tradeoffs, that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

PLUS HS+E.1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Rationale: Identify water sustainability efforts, water, and soil units.

4.6 Evaluate how agriculture manages water use, wastewater systems, and water recycling opportunities

Chemistry HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

Earth and Space HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

PLUS HS+E.1U3.10 Ask questions, define problems, and evaluate a solution to a complex problem, based on prioritized criteria and tradeoffs, that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

PLUS HS+E.1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Physics HS.P4U3.9 Engage in argument from evidence regarding the ethical, social, economic, and/or political benefits and liabilities of energy usage and transfer.

Rationale: Evaluate water recycling efforts, water, and soil units.

4.7 Analyze environmental factors associated with animal and plant production including sanitation and economics

Earth and Space HS.E1U1.11 Analyze and interpret data to determine how energy from the Sun affects weather patterns and climate.

HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

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PLUS HS+E.1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Life Science HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

HS.L4U1.28 Gather, evaluate, and communicate multiple lines of empirical evidence to explain the mechanisms of biological evolution.

Rationale: Investigate animal and plant production adaptations to climate.

4.8 Describe the effect of agriculture on the food web cycle, or the natural interconnection of food chains

STANDARD 5.0 EXAMINE SOIL MANAGEMENT FOR PLANT AND ANIMAL PRODUCTION

5.1 Describe formation, properties, texture, structure, and composition of soil

Earth and Space HS.E1U1.12 Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).

HS.E1U1.13 Evaluate explanations and theories about the role of energy and matter in geologic changes over time.

Rationale: Study soil unit formations.

5.2 Examine the relationship among soil characteristics, microflora, and environmental conditions

Earth and Space HS.E1U1.12 Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).

Life Science HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

HS.L2U1.19 Develop and use models that show how changes in the transfer of matter and energy within an ecosystem and interactions between species may affect organisms and their environment.

Rationale: Investigate soils and biodiversity.

5.3 Analyze methods to control soil erosion

Earth and Space HS.E1U1.12 Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).

HS.E1U1.13 Evaluate explanations and theories about the role of energy and matter in geologic changes over time.

HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

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PLUS HS+E.E1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Rationale: Study soil erosions and soil management. (*same science standards for 5.3 - 5.5*)

- 5.4 Analyze slope, erosion, and water movement in determining land capability, land use, and agricultural production

Earth and Space HS.E1U1.12 Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).

HS.E1U1.13 Evaluate explanations and theories about the role of energy and matter in geologic changes over time.

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PLUS HS+E.E1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Rationale: Study soil erosions and soil management. (*same science standards for 5.3 - 5.5*)

- 5.5 Formulate appropriate soil management practices on various sites

Earth and Space HS.E1U1.12 Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).

HS.E1U1.13 Evaluate explanations and theories about the role of energy and matter in geologic changes over time.

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PLUS HS+E.E1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Rationale: Study soil erosions and soil management. (*same science standards for 5.3 - 5.5*)

STANDARD 6.0 EXAMINE CELL BIOLOGY, STRUCTURES, AND PROCESSES

- 6.1 Differentiate among cells, organelles, tissues, and organs' systems

Biology PLUS HS+B.L1U1.4 Develop and use models to explain the interdependency and interactions between cellular organelles.

PLUS HS+B.L1U1.5 Analyze and interpret data that demonstrates the relationship between cellular function and the diversity of protein functions.

PLUS HS+B.L1U1.6 Develop and use models to show how transport mechanisms function in cells.

PLUS HS+B.L1U1.7 Develop and use models to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (plant and animal).

Life Science HS.L1U1.20 Ask questions and/or make predictions based on observations and evidence to demonstrate how cellular organization, structure, and function allow organisms to maintain homeostasis.

HS.L1U1.22 Construct an explanation for how cellular division (mitosis) is the process by which organisms grow and maintain complex, interconnected systems.

Rationale: Study cellular processes (cell unit).

- 6.2 Describe the structure and function of DNA

Biology PLUS HS+B.L1U1.4 Develop and use models to explain the interdependency and interactions between cellular organelles.

PLUS HS+B.L1U1.5 Analyze and interpret data that demonstrates the relationship between cellular function and the diversity of protein functions.

PLUS HS+B.L1U1.6 Develop and use models to show how transport mechanisms function in cells.

PLUS HS+B.L1U1.7 Develop and use models to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (plant and animal).

Life Science HS.L1U1.20 Ask questions and/or make predictions based on observations and evidence to demonstrate how cellular organization, structure, and function allow organisms to maintain homeostasis.

HS.L1U1.22 Construct an explanation for how cellular division (mitosis) is the process by which organisms grow and maintain complex, interconnected systems.

HS.L3U1.24 Construct an explanation of how the process of sexual reproduction contributes to genetic variation.

HS.L4U1.27 Obtain, evaluate, and communicate evidence that describes how changes in frequency of inherited traits in a population can lead to biological diversity.

Rationale: Study cellular processes (cell unit), genetics and DNA.

6.3 Describe the process of creating proteins from DNA

Biology PLUS HS+B.L1U1.4 Develop and use models to explain the interdependency and interactions between cellular organelles.

PLUS HS+B.L1U1.5 Analyze and interpret data that demonstrates the relationship between cellular function and the diversity of protein functions.

PLUS HS+B.L1U1.6 Develop and use models to show how transport mechanisms function in cells.

PLUS HS+B.L1U1.7 Develop and use models to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (plant and animal).

Life Science HS.L1U1.20 Ask questions and/or make predictions based on observations and evidence to demonstrate how cellular organization, structure, and function allow organisms to maintain homeostasis.

HS.L1U1.22 Construct an explanation for how cellular division (mitosis) is the process by which organisms grow and maintain complex, interconnected systems.

HS.L3U1.24 Construct an explanation of how the process of sexual reproduction contributes to genetic variation.

Rationale: Study cellular processes (cell unit), genetics and DNA synthesis (DNA unit).

6.4 Describe cellular processes (i.e., osmosis, mitosis, phagocytosis, meiosis, diffusion, etc.)

Biology PLUS HS+B.L1U1.4 Develop and use models to explain the interdependency and interactions between cellular organelles.

PLUS HS+B.L1U1.5 Analyze and interpret data that demonstrates the relationship between cellular function and the diversity of protein functions.

PLUS HS+B.L1U1.6 Develop and use models to show how transport mechanisms function in cells.

PLUS HS+B.L1U1.7 Develop and use models to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (plant and animal).

Life Science HS.L1U1.20 Ask questions and/or make predictions based on observations and evidence to demonstrate how cellular organization, structure, and function allow organisms to maintain homeostasis.

HS.L1U1.21 Obtain, evaluate, and communicate data showing the relationship of photosynthesis and cellular respiration; flow of energy and cycling of matter.

HS.L1U1.22 Construct an explanation for how cellular division (mitosis) is the process by which organisms grow and maintain complex, interconnected systems.

HS.L1U3.23 Obtain, evaluate, and communicate the ethical, social, economic and/or political implications of the detection and treatment of abnormal cell function.

HS.L3U1.24 Construct an explanation of how the process of sexual reproduction contributes to genetic variation.

Rationale: Study cellular process and genetics unit.

6.5 Examine the molecular basis of heredity and resulting genetic diversity

Life Science HS.L1U3.23 Obtain, evaluate, and communicate the ethical, social, economic and/or political implications of the detection and treatment of abnormal cell function.

HS.L3U1.24 Construct an explanation of how the process of sexual reproduction contributes to genetic variation.

HS.L3U1.25 Obtain, evaluate, and communicate information about the causes and implications of DNA mutation.

HS.L3U3.26 Engage in argument from evidence regarding the ethical, social, economic, and/or political implications of a current genetic technology.

HS.L4U1.27 Obtain, evaluate, and communicate evidence that describes how changes in frequency of inherited traits in a population can lead to biological diversity.

HS.L4U1.28 Gather, evaluate, and communicate multiple lines of empirical evidence to explain the mechanisms of biological evolution.

Rationale: Study genetics unit.

6.6 Define the essential macromolecules of life science (i.e., carbohydrates, proteins, lipids, nucleic acids, etc.)

STANDARD 7.0 ANALYZE PLANT SCIENCE PRINCIPLES

7.1 Describe plant anatomy and the functions of plant structures (e.g., root, stem, leaf, and flower)

7.2 Classify plants according to taxonomic systems, use, structure, and life span

Biology PLUS HS+B.L1U1.7 Develop and use models to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (plant and animal)

Rationale: Classification

7.3 Describe basic factors in plant growth (e.g., light, water, climate, temperature, and nutrients)

Biology PLUS HS+B.L1U1.4 Develop and use models to explain the interdependency and interactions between cellular organelles.

PLUS HS+B.L1U1.5 Analyze and interpret data that demonstrates the relationship between cellular function and the diversity of protein functions.

PLUS HS+B.L1U1.6 Develop and use models to show how transport mechanisms function in cells.

PLUS HS+B.L1U1.7 Develop and use models to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (plant and animal).

Life Science HS.L2U1.19 Develop and use models that show how changes in the transfer of matter and energy within an ecosystem and interactions between species may affect organisms and their environment.

HS.L1U1.20 Ask questions and/or make predictions based on observations and evidence to demonstrate how cellular organization, structure, and function allow organisms to maintain homeostasis.

HS.L1U1.21 Obtain, evaluate, and communicate data showing the relationship of photosynthesis and cellular respiration; flow of energy and cycling of matter.

Rationale: Plant growth and production

- 7.4 Apply knowledge of plant physiology and energy conversion to plant systems (e.g., photosynthesis, respiration, and transpiration)

Life Science HS.L2U1.19 Develop and use models that show how changes in the transfer of matter and energy within an ecosystem and interactions between species may affect organisms and their environment.

HS.L1U1.21 Obtain, evaluate, and communicate data showing the relationship of photosynthesis and cellular respiration; flow of energy and cycling of matter.

Rationale: Plant physiology (photosynthesis and respiration) and plant growth

- 7.5 Describe plant life cycle stages (i.e., germination, root growth, pollination, fruit development, etc.)

Life Science HS.L2U1.19 Develop and use models that show how changes in the transfer of matter and energy within an ecosystem and interactions between species may affect organisms and their environment.

Rationale: Classification Unit

- 7.6 Demonstrate plant germination, growth, and development

Life Science HS.L1U1.21 Obtain, evaluate, and communicate data showing the relationship of photosynthesis and cellular respiration; flow of energy and cycling of matter.

Rationale: Plant growth and development

- 7.7 Investigate changes in growing conditions and the impact on plant growth and development (i.e., light, gravity, touch, water, heat, etc.)

Earth and Space HS.E1U1.11 Analyze and interpret data to determine how energy from the Sun affects weather patterns and climate.

Life Science HS.L2U1.19 Develop and use models that show how changes in the transfer of matter and energy within an ecosystem and interactions between species may affect organisms and their environment.

HS.L1U1.21 Obtain, evaluate, and communicate data showing the relationship of photosynthesis and cellular respiration; flow of energy and cycling of matter.

Rationale: Plant growth, development, and production. Investigate greenhouse management.

STANDARD 8.0 DEMONSTRATE CONCEPTS OF PLANT MANAGEMENT

- 8.1 Analyze the nutritional needs of plants

Life Science HS.L2U1.19 Develop and use models that show how changes in the transfer of matter and energy within an ecosystem and interactions between species may affect organisms and their environment.

HS.L1U1.21 Obtain, evaluate, and communicate data showing the relationship of photosynthesis and cellular respiration; flow of energy and cycling of matter.

Rationale: Plant nutrient unit

- 8.2 Research common nutrient deficiency symptoms and treatment options (i.e., fertilizers, soil amendments, crop rotation, etc.)

Biology PLUS HS+B.L1U1.4 Develop and use models to explain the interdependency and interactions between cellular organelles.

PLUS HS+B.L1U1.5 Analyze and interpret data that demonstrates the relationship between cellular function and the diversity of protein functions.

PLUS HS+B.L1U1.6 Develop and use models to show how transport mechanisms function in cells.

PLUS HS+B.L1U1.7 Develop and use models to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (plant and animal). **Chemistry HS.P1U3.4** Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

Life Science HS.L1U3.23 Obtain, evaluate, and communicate the ethical, social, economic and/or political implications of the detection and treatment of abnormal cell function. cellular organization, structure, and function allow organisms to maintain homeostasis.

Rationale: Plant nutrition and diseases

8.3 Prepare grow media for use in plant systems (i.e., soil, water, vermiculite, coconut core, etc.)

8.4 Analyze soil conditions to make nutritional decisions (i.e., pH meter, soil test kits, soil probes, etc.)

Chemistry HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

Life Science HS.L1U1.20 Ask questions and/or make predictions based on observations and evidence to demonstrate how cellular organization, structure, and function allow organisms to maintain homeostasis.

Biology PLUS HS+B.L1U1.4 Develop and use models to explain the interdependency and interactions between cellular organelles.

PLUS HS+B.L1U1.5 Analyze and interpret data that demonstrates the relationship between cellular function and the diversity of protein functions.

PLUS HS+B.L1U1.6 Develop and use models to show how transport mechanisms function in cells.

PLUS HS+B.L1U1.7 Develop and use models to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (plant and animal).

Rationale: Plant growth and production soils

8.5 Implement a fertilization plan for specific plants or crops

Chemistry HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

Rationale: Plant nutrition

8.6 Investigate methods for sexual reproduction of plants (i.e., cross-pollination, scarification, stratification, etc.)

Life Science HS.L3U1.24 Construct an explanation of how the process of sexual reproduction contributes to genetic variation.

HS.L3U3.26 Engage in argument from evidence regarding the ethical, social, economic, and/or political implications of a current genetic technology.

HS.L4U1.2 Obtain, evaluate, and communicate evidence that describes how changes in frequency of inherited traits in a population can lead to biological diversity. process by which organisms grow and maintain complex, interconnected systems.

HS.L1U3.23 Obtain, evaluate, and communicate the ethical, social, economic and/or political implications of the detection and treatment of abnormal cell function.

Rationale: Plant sexual reproduction

8.7 Investigate methods for asexual reproduction of plants (i.e., propagation, grafting, layering, tissue culture, plant hormones, etc.)

Life Science HS.L1U1.22 Construct an explanation for how cellular division (mitosis) is the process by which organisms grow and maintain complex, interconnected systems

HS.L1U3.23 Obtain, evaluate, and communicate the ethical, social, economic and/or political implications of the detection and treatment of abnormal cell function.

HS.L3U1.25 Obtain, evaluate, and communicate information about the causes and implications of DNA mutation.

HS.L3U3.26 Engage in argument from evidence regarding the ethical, social, economic, and/or political implications of a current genetic technology.

HS.L4U1.27 Obtain, evaluate, and communicate evidence that describes how changes in frequency of inherited traits in a population can lead to biological diversity.

Rationale: Study propagation and tissue culture. Investigate plant reproduction including biotech/plant asexual reproduction.

8.8 Demonstrate plant propagation techniques (e.g., sexual and asexual)

8.9 Describe techniques to harvest, handle, and store crops according to current industry standards

8.10 Create a sustainable management plan for plant production

Earth and Space HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.E1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

PLUS HS+E.E1U3.10 Ask questions, define problems, and evaluate a solution to a complex problem, based on prioritized criteria and tradeoffs, that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

PLUS HS+E.E1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Life Science HS.L2U1.19 Develop and use models that show how changes in the transfer of matter and energy within an ecosystem and interactions between species may affect organisms and their environment.

HS.L1U3.23 Obtain, evaluate, and communicate the ethical, social, economic and/or political implications of the detection and treatment of abnormal cell function.

HS.L3U1.24 Construct an explanation of how the process of sexual reproduction contributes to genetic variation.
HS.L3U3.26 Engage in argument from evidence regarding the ethical, social, economic, and/or political implications of a current genetic technology.
HS.L4U1.28 Gather, evaluate, and communicate multiple lines of empirical evidence to explain the mechanisms of biological evolution.
Rationale: Plant production plan

STANDARD 9.0 ANALYZE ANIMAL SCIENCE PRINCIPLES

- 9.1 Define common terminology related to animal science and production practices (i.e., gender, age, dehorning, castration, identification, tail docking, etc.)
- 9.2 Classify animals according to taxonomic classification systems and use (e.g., agricultural and companion)
- 9.3 Differentiate among large stock, small stock, and companion animals
- 9.4 Explain basic anatomy and external parts of production animals
- 9.5 Apply principles of comparative anatomy and physiology to use within animal systems (e.g., circulatory, endocrine, immune, integumentary, musculoskeletal, nervous, reproductive, respiratory, and urinary)

Biology PLUS HS+B.L1U1.4 Develop and use models to explain the interdependency and interactions between cellular organelles.

PLUS HS+B.L1U1.5 Analyze and interpret data that demonstrates the relationship between cellular function and the diversity of protein functions.

PLUS HS+B.L1U1.6 Develop and use models to show how transport mechanisms function in cells.

PLUS HS+B.L1U1.7 Develop and use models to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (plant and animal).

Life Science HS.L1U1.20 Ask questions and/or make predictions based on observations and evidence to demonstrate how cellular organization, structure, and function allow organisms to maintain homeostasis.

Rationale: Study animal anatomy.

- 9.6 Describe a livestock animal's digestive system (i.e., avian, modified digestion, ruminant, etc.)

Biology PLUS HS+B.L1U1.4 Develop and use models to explain the interdependency and interactions between cellular organelles.

PLUS HS+B.L1U1.5 Analyze and interpret data that demonstrates the relationship between cellular function and the diversity of protein functions.

PLUS HS+B.L1U1.6 Develop and use models to show how transport mechanisms function in cells.

PLUS HS+B.L1U1.7 Develop and use models to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (plant and animal).

Life Science HS.L1U1.20 Ask questions and/or make predictions based on observations and evidence to demonstrate how cellular organization, structure, and function allow organisms to maintain homeostasis.

HS.L1U1.21 Obtain, evaluate, and communicate data showing the relationship of photosynthesis and cellular respiration; flow of energy and cycling of matter.

Rationale: Study animal anatomy and nutrition as well as cellular processes and nutrition (e.g., digestion)

- 9.7 Describe the basic principles of animal welfare (e.g., appropriate environment, facilities, food, healthcare, proper handling, and water)

Biology PLUS HS+B.L1U1.6 Develop and use models to show how transport mechanisms function in cells.

PLUS HS+B.L1U1.7 Develop and use models to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms (plant and animal).

Life Science HS.L1U1.20 Ask questions and/or make predictions based on observations and evidence to demonstrate how cellular organization, structure, and function allow organisms to maintain homeostasis.

PLUS HS+B.L1U1.4 Develop and use models to explain the interdependency and interactions between cellular organelles.

PLUS HS+B.L1U1.5 Analyze and interpret data that demonstrates the relationship between cellular function and the diversity of protein functions.

Rationale: Animal welfare (homeostasis)

STANDARD 10.0 DEMONSTRATE CONCEPTS OF ANIMAL MANAGEMENT

- 10.1 Recognize animal behaviors to facilitate safely working with animals
- 10.2 Investigate the nature and properties of food, fiber, and by-products from animals
- 10.3 Differentiate between major wholesale/retail meat cuts of beef, pork, lamb, and poultry and compare the value of various meat cuts
- 10.4 Explore the use of alternative livestock in animal agriculture (i.e., antelope, elk, buffalo, alpacas, ostrich, deer, etc.)
- 10.5 Analyze the nutritional roles and needs of animals

Chemistry HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

Rationale: Animal nutrition

10.6 Analyze feed rations to meet the nutritional needs of animals

10.7 Develop a plan to treat animal ailments

Life Science HS.L1U3.23 Obtain, evaluate, and communicate the ethical, social, economic and/or political implications of the detection and treatment of abnormal cell function.

Rationale: Animal diseases

10.8 Differentiate among animal selection, reproduction, breeding, and genetics

Life Science HS.L1U3.23 Obtain, evaluate, and communicate the ethical, social, economic and/or political implications of the detection and treatment of abnormal cell function.

HS.L3U1.24 Construct an explanation of how the process of sexual reproduction contributes to genetic variation.

HS.L3U1.25 Obtain, evaluate, and communicate information about the causes and implications of DNA mutation.

HS.L3U3.26 Engage in argument from evidence regarding the ethical, social, economic, and/or political implications of a current genetic technology.

HS.L4U1.27 Obtain, evaluate, and communicate evidence that describes how changes in frequency of inherited traits in a population can lead to biological diversity.

Rationale: Animal selection, reproduction, and genetics.

10.9 Demonstrate animal selection based on reproduction, breeding, and genetics

10.10 Explore how animals are evaluated for breeding readiness and soundness

Life Science HS.L4U1.27 Obtain, evaluate, and communicate evidence that describes how changes in frequency of inherited traits in a population can lead to biological diversity.

HS.L4U1.28 Gather, evaluate, and communicate multiple lines of empirical evidence to explain the mechanisms of biological evolution.

HS.L4U1.28 Gather, evaluate, and communicate multiple lines of empirical evidence to explain the mechanisms of biological evolution.

Rationale: Animal reproduction and production plan

10.11 Create a sustainable reproduction management plan

Earth and Space HS.E1U1.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.

PLUS HS+E.E1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

PLUS HS+E.E1U3.10 Ask questions, define problems, and evaluate a solution to a complex problem, based on prioritized criteria and tradeoffs, that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

PLUS HS+E.E1U3.11 Develop and use a quantitative model to illustrate the relationship among Earth systems and the degree to which those relationships are being modified due to human activity.

Life Science HS.L1U3.23 Obtain, evaluate, and communicate the ethical, social, economic and/or political implications of the detection and treatment of abnormal cell function.

HS.L3U1.24 Construct an explanation of how the process of sexual reproduction contributes to genetic variation.

HS.L3U3.26 Engage in argument from evidence regarding the ethical, social, economic, and/or political implications of a current genetic technology.

Rationale: Animal production plan

10.12 Demonstrate proper methods to clean and disinfect animal equipment and facilities

10.13 Demonstrate proper use of animal medications following established withdrawal protocols

Life Science HS.L3U3.26 Engage in argument from evidence regarding the ethical, social, economic, and/or political implications of a current genetic technology.

Rationale: Animal management and disease prevention

STANDARD 11.0 ANALYZE PRINCIPLES OF INTEGRATED PEST MANAGEMENT (IPM) IN PLANT AND ANIMAL SYSTEMS

11.1 Identify pests and signs of pest damage (i.e., parasites, rodents, weeds, insects, etc.)

11.2 Identify pest control methods used to manage pest damage (i.e., cultural, mechanical, biological, chemical, etc.)

11.3 Evaluate economic impact of pests on production

Life Science HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

HS.L2U1.19 Develop and use models that show how changes in the transfer of matter and energy within an ecosystem and interactions between species may affect organisms and their environment.

Rationale: IPM beneficials

- 11.4 Discuss biosecurity measures utilized to protect the welfare of animals on a local, state, national, and global level
- 11.5 Read and interpret pesticide labels
- 11.6 Investigate safe pesticide application practices

Chemistry HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

Rationale: IPM

- 11.7 Apply pesticides safely according to good manufacturing practices (GMPs)

Chemistry HS.P1U3.4 Obtain, evaluate, and communicate information about how the use of chemistry related technologies have had positive and negative ethical, social, economic, and/or political implications.

Life Science HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem.

Rationale: IPM

STANDARD 12.0 EXAMINE FOOD SAFETY AND PROCESSING PRACTICES

- 12.1 Investigate government agencies that impact agriculture and food production
- 12.2 Analyze food product labels
- 12.3 Evaluate food processing best practices (i.e., HACCP, quality assurance, food safety standards, etc.)
- 12.4 Develop a plan to prevent foodborne illness in agricultural products

STANDARD 13.0 APPLY PRACTICES AND PROCEDURES FOR PLANNING, BUILDING, AND MAINTAINING STRUCTURES

- 13.1 Identify legal land descriptions
- 13.2 Investigate techniques used to survey land
- 13.3 Create sketches and plans for structures
- 13.4 Determine structural requirements, specifications, and estimate costs for structures (i.e., bill of materials)
- 13.5 Follow architectural and mechanical plans to construct, maintain, and/or repair agricultural structures (i.e., material selection, site preparation and/or layout, plumbing, concrete/masonry, electrical wiring, wood fabrication, etc.)
- 13.6 Design animal, plant, and mechanical facilities including equipment
- 13.7 Manage basic facility maintenance, installation, or repair

STANDARD 14.0 DEMONSTRATE OPERATION OF TOOLS, EQUIPMENT, AND INSTRUMENTS

- 14.1 Demonstrate safe operating instructions and procedures as recommended by the manufacturer
- 14.2 Utilize service manuals to perform preventative maintenance and determine scheduled service on tools, equipment, and instruments, including small engines
- 14.3 Maintain hand tools and power equipment (i.e., hand saws, power saws, welders, leaf blowers, etc.)
- 14.4 Demonstrate a variety of metal fabrication, welding, soldering, cutting, and finishing processes (i.e., SMAW, GMAW, GTAW, fuel-oxygen, plasma arc torch, etc.)
- 14.5 Demonstrate a variety of wood fabrication and finishing processes
- 14.6 Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods
- 14.7 Utilize manufacturers' guidelines to diagnose, troubleshoot, and repair machinery, equipment, and power source systems (i.e., hydraulic, pneumatic, transmission, steering, suspension, etc.)

STANDARD 15.0 DEMONSTRATE AGRIBUSINESS MANAGEMENT, FINANCE, AND MARKETING SKILLS

- 15.1 Define basic business terminology (i.e., entrepreneurship/placement, capital, budget, solvent, management, assets, liability, economics, etc.)
- 15.2 Differentiate between macro- and micro-economics
- 15.3 Identify financial records important to business management
- 15.4 Use management software and information technology [i.e., spreadsheets, databases, presentation software, record-keeping software, electronic record book, agriculture experience tracker (AET), etc.]
- 15.5 Analyze business records and record-keeping procedures
- 15.6 Identify tax structure of agricultural business (i.e., property tax, intangible taxes, income taxes, etc.)
- 15.7 Apply the decision-making process for budgeting issues
- 15.8 Identify methods of obtaining capital resources
- 15.9 Explain the purposes and structures of contracts, leases, deeds, and insurance policies

- 15.10 Compare types of markets and influence factors (i.e., commodity markets, foreign markets, competition, etc.)
- 15.11 Identify methods of managing risk
- 15.12 Describe the purpose and importance of marketing
- 15.13 Develop a marketing plan
- 15.14 Create a business plan

STANDARD 16.0 EXAMINE TECHNOLOGY TOOLS AND SYSTEMS USED TO ACCESS, MANAGE, INTEGRATE, AND CREATE INFORMATION AND SOLVE PROBLEMS

- 16.1 Use industry-relevant software and internet applications
- 16.2 Use collaborative and virtual meeting software
- 16.3 Analyze the benefits and limitations of emerging technology such as geospatial, online mapping systems, drones, and robotics
- 16.4 Explain the benefits of computer-based and mobile application equipment
- 16.5 Apply computer and other technologies to solve problems and increase efficiency [i.e., LabQuest, programmable logic controller (PLC), Geospatial Information System (GIS), Computer numeric control (CNC), Unmanned aircraft system (UAS), etc.]