



School District of Marshfield Course Syllabus

Course Name: ES Agriscience

Grade(s): 9-12

Length of Course: Year

Credit: 1 Credit

Program Goal:

The School District of Marshfield Agriculture Education Program will provide learners the opportunity to explore and develop interests in various areas of agriculture while preparing young adults for their next steps in life. Whether it is pursuing a postsecondary education or entering the world of work, Marshfield's agriculture program offers diverse experiences for all students in agriculture, horticulture and natural resources. Marshfield's agriculture program will provide valuable learning experiences for all learners whether they want to learn more about the importance of agriculture on society, have a hobby related to agriculture or are preparing for an agriculture related career.

Course Description:

ES Agriscience is an equivalent science course where "Learning by doing" activities provide exposure to plant science, horticulture, integrated pest management, animal nutrition, animal physiology, genetics, reproduction, forestry, wildlife management, natural resources and food

science. The greenhouse, hydroponics lab, cheesemaking lab and computer lab will be used as laboratories for various activities dealing with soils, plants, animals, food, and horticulture.

Wisconsin Standards for Agriculture, Food and Natural Resources (AFNR)	
Animal Systems (AS)	
AS1: Students will examine the components, historical development, global implications and future trends of the animal systems industry.	
Evaluate the development and implications of animal origin, domestication and distribution. AS1.a	1.a.5.h: Evaluate and describe characteristics of animals that developed in response to the animals' environment and led to their domestication. 1.a.6.h: Outline the development of the animal industry and resulting products, services and careers. 1.a.7.h: Predict adaptations of animals to production practices and environments. 1.a.8.h: Predict trends and implications of future development of the animal systems industry.
AS2: Students will classify, evaluate, select and manage animals based on anatomical and physiological characteristics.	
Classify animals according to hierarchical taxonomy and agricultural use. AS2.a	2.a.5.h: Compare and contrast the hierarchical classification of the major agricultural animal species. 2.a.7.h: Appraise and evaluate the economic value of animals for various applications in the agriculture industry.
Apply principles of comparative anatomy and physiology to uses within various animal systems. AS2.b	2.b.6.h: Compare and contrast animal cells, tissues, organs and body systems and describe their functions. 2.b.7.h: Detail the processes and application of meiosis and mitosis in animal growth, development, health and reproduction. 2.b.8.h: Explain the relationship, importance and uses of animal tissues to growth, performance and health in the agriculture industry. 2.b.9.h: Compare and contrast organ types, functions and body systems adaptations among and between animal species. 2.b.10.h: Explain how the components and systems of anatomy and physiology relate to the production and use of animals. 2.b.12.h: Explain the impact of animal body systems on health, growth and reproduction.
Select animals for specific purposes and maximum performance based on anatomy and physiology. AS2.c	2.c.4.h: Compare and contrast desirable anatomical and physiological characteristics of animals within and between species.
AS3: Students will provide for the proper health care of animals.	

Prescribe and implement a prevention treatment program for animal diseases, parasites and other disorders. AS3.a	3.a.8.h: Perform simple health-check evaluations on animals. 3.a.10.h: Diagnose illnesses and disorders of animals based on symptoms and problems caused by diseases, parasites and physiological disorders. 3.a.11.h: Treat common diseases, parasites and physiological disorders of animals. 3.a.12.h: Evaluate preventive measures for controlling and limiting the spread of diseases, parasites and disorders among animals.
Identify bio-security threats and provide for the bio-security of agricultural animals and production facilities. AS3.b	3.b.4.h: Explain the health risk of zoonotic diseases to humans and their historical significance and future implications. 3.b.6.h: Discuss procedures at the local, state and national levels to ensure biosecurity of the animal industry.
AS4: Students will apply principles of animal nutrition to ensure the proper growth, development, reproduction and economic production of animals.	
Formulate feed rations to provide for the nutritional needs of animals. AS4.a	4.a.4.h: Determine the relative nutritional value of feedstuffs by evaluating their general quality and condition. 4.a.6.h: Select appropriate feedstuffs for animals based on factors such as economics, digestive system and nutritional needs. 4.a.7.h: Formulate animal feeds based on nutritional requirements, using feed ingredients for maximum nutrition and optimal economic production.
Prescribe and administer animal feed additives and growth promotants in animal production. AS4.b	4.b.3.h: Discuss how feed additives and growth promotants are administered and the precautions that should be taken.
AS5: Students will evaluate and select animals based on scientific principles of animal production.	
Evaluate the male and females reproductive systems in selecting animals. AS5.a	5.a.3.h: Describe the functions of major organs in the male and female reproductive systems. 5.a.4.h: Select breeding animals based on characteristics of the reproductive organs.
Evaluate animals for breeding readiness and soundness. AS5.b	5.b.2.h: Summarize factors that lead to reproductive maturity.
Describe how selection and geographical regions impact the economic decisions of our livestock business. AS5.c	5.c.3.h: Evaluate reproductive problems that occur in animals.
Apply scientific principles in the selection and breeding of animals. AS5.d	5.d.3.h: Explain the advantages of using genetically superior animals in the production of animals and animal products. 5.d.4.h: Select a breeding system based on the principles of genetics and reproductive/economic efficiencies.

Compare and contrast scientific methods associated with animal reproduction. AS5.f	5.f.6.h: Explain the processes of natural and artificial breeding methods. 5.f.8.h: Select animals based on quantitative breeding values for specific characteristics. 5.f.9.h: Explain the processes of major reproductive management practices, including estrous synchronization, superovulation, flushing and embryo transfer. 5.f.11.h: Explain and demonstrate the materials, methods and processes of artificial insemination.
AS6: Students will prepare and implement animal handling procedures for the safety of animals, producers and consumers of animal products.	
Formulate feed rations to provide for the nutritional needs of animals. AS6.a	6.a.5.h: Design programs that assure the welfare of animals and prevent abuse or mistreatment. 6.a.6.h: Interpret animal behaviors and execute protocols for safe handling of animals.
Formulate feed rations to provide for the nutritional needs of animals. AS6.b	6.b.4.h: Discuss consumer concerns with animal production practices relative to human health.
AS7: Students will select animal facilities and equipment that provide for the safe and efficient production, housing and handling of animals.	
Design animal housing, equipment and handling facilities for the major systems of animal production. AS7.a	7.a.6.h: Explain how modern equipment and handling facilities enhance the safe and economic production of animals.
AS8: Students will analyze environmental factors associated with animal production.	
Outline methods of reducing the effects of animal agriculture on the environment. AS8.a	8.a.3.h: Outline methods of reducing the effects of animal agriculture on the environment.
Evaluate the effects of environmental conditions on animals. AS8.b	8.b.2.h: Describe the effects of environmental conditions on animal populations and performance.
Food Production and Processing (FPP)	
FPP1: Students will examine components of the food industry and historical development of food products and processing.	
Evaluate the significance and implications of changes and trends in the food products and processing industry. FPP1.a	1.a.5.h: Evaluate changes and trends in the food products and processing industry and be able to predict trends and implications in the food products and processing industry.
FPP4: Students will select and process food products for storage, distribution and consumption.	
Use harvesting, selection and inspection techniques to obtain quality food products for processing. FPP4.a	4.a.9.h: Assign quality and yield grades to food products according to industry standards. 4.a.12.h: Investigate the role and responsibilities of a USDA meat inspector.

Environmental Service Systems (ESS)	
ESS2: Students will apply scientific principles to environmental service systems.	
Apply meteorology principles to environmental service systems. ESS2.a	2.a.12.h: Explain the basics and contributing factors of the greenhouse effect and how it alters the earth's balance of energy including greenhouse gasses.
Apply soil science and microbiology principles to environmental service systems. ESS2.b	2.b.13.h: Differentiate rocks relating chemical composition of mineral matter in soils to the parent material with a connection to environmental service systems. 2.b.15.h: Identify physical soil qualities, through testing, that determine its use for environmental service systems. 2.b.16.h: Determine land capability classes for land parcels and design a land-use management plan for a given area.
Apply hydrology principles to environmental service systems. ESS2.c	2.c.13.h: Describe and research water characteristics that influence the biosphere for life and be able to identify current environmental water issues. 2.c.15.h: Identify differences in groundwater potential delineate groundwater potential zones. 2.c.16.h: Describe precautions taken to prevent/reduce groundwater contamination while testing and documenting results of related tests.
Apply best management techniques associated with the properties, classifications and functions of wetlands. ESS2.d	2.d.11.h: Identify techniques used to evaluate a wetland, record conditions of a local wetland followed by application of proper techniques used to manage, create and restore a wetland.
Natural Resources (NR)	
NR1: Students will explain interrelationships between natural resources and humans necessary to conduct management activities in natural environments.	
Classify natural resources. NR1.b	1.b.11.h: Compare and contrast trees and other woody plants. 1.b.12.h: Compare and contrast herbaceous plants. 1.b.13.h: Compare and contrast wildlife species. 1.b.15.h: Identify rock, mineral and soil types.
NR2: Students will apply scientific principles to natural resource management activities.	
Demonstrate natural resource enhancement techniques. NR2.c	2.c.17.h: Explain natural resource management techniques for improving recreation opportunities.
NR3: Students will apply knowledge of natural resources to production and processing industries.	
Produce, harvest, process and use natural resource products. NR3.a	3.a.15.h: List and describe uses of trees species and determine when to harvest forest products.
NR4: Students will demonstrate techniques used to protect natural resources.	

Diagnose plant and wildlife diseases and follow protocol to prevent their spread while acquiring management protocol of insect infestations of natural resources. NR4.b	4.b.8.h: Report observance of insect pests to the appropriate authorities and describe techniques used to manage pests of natural resources.
Plant Systems (PS)	
PS1: Students will apply knowledge of plant classification, anatomy and physiology to the production and management of plants.	
Classify agricultural plants according to taxonomy systems. PS1.a	1.a.7.h: Classify agricultural plants according to the hierarchical classification system, life cycles, plant use and as monocotyledons or dicotyledons.
Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems. PS1.b	1.b.9.h: Compare and contrast mitosis and meiosis and apply the knowledge of cell differentiation and the functions of the major types of cells to plant systems. 1.b.10.h: Identify root tissues and explain the pathway of water and nutrients into and through the root tissues. 1.b.12.h: Describe and apply the processes of translocation to the management of plants. 1.b.13.h: Explain how leaves capture light energy and allow for the exchange of gases. 1.b.14.h: Identify the different types of flowers and flower forms and apply the knowledge of flower structures to plant breeding, production and use.
Apply energy conversion to plant systems. PS1.c	1.c.6.h: Explain cellular respiration and its importance to plant life.
Apply knowledge of plant physiology to plant systems. PS1.d	1.d.7.h: Relate the principles of primary and secondary growth to plant systems. 1.d.10.h: Select plant growth regulators to produce desired responses from plants.
PS2: Students will prepare and implement a plant management plan that addresses the influence of environmental factors, nutrients and soil on plant growth.	
Determine the influence of environmental factors on plant growth. PS2.a	2.a.7.h: Evaluate plant responses to varied light color, intensity and duration.
Prepare growing media for use in plant systems. PS2.b	2.b.5.h: Describe the physical characteristics of growing media and explain the influence they have on plant growth. 2.b.6.h: Formulate and prepare growing media for specific plants or crops.
Develop and implement a fertilization plan for specific plants, field crops and/or greenhouse crops. PS2.c	2.c.7.h: Describe nutrient deficiency symptoms, recognize environmental causes of nutrient deficiencies and prepare a scouting report. 2.c.12.h: Calculate the amount of fertilizer to be applied and calibrate equipment to apply the prescribed amount of fertilizer.

PS3: Students will propagate, culture and harvest plants.	
Demonstrate plant propagation techniques. PS3.a	3.a.10.h: Evaluate asexual propagation practices based on productivity and efficiency.
Develop and implement a plant management plan for crop production. PS3.b	3.b.10.h: Inspect propagation material for evidence of pests or disease. 3.b.15.h: Demonstrate proper techniques to control and manage plant growth through mechanical, cultural or chemical means.
Develop and implement a plan for integrated pest management. PS3.c	3.c.9.h: Describe pest control strategies associated with integrated pest management. 3.c.10.h: Describe types of pesticide controls and formulations. 3.c.12.h: Explain risks and benefits associated with the materials and methods used in plant pest management. 3.c.13.h: Explain procedures for the safe handling, use and storage of pesticides.
PS5: Students will recognize different systems in which plants grow.	
Investigate various means to grow plants. PS5.a	5.a.3.h: Compare and contrast various plant growing systems including, but not limited to greenhouse, hydroponics, and aquaponics.
Wisconsin Common Career Technical Standards (WCCTS)	
Creativity, Critical Thinking, Communication and Collaboration (4C)	
4C1: Students will think and work creatively to develop innovative solutions to problems and opportunities.	
Work creatively with others to develop solutions, products and services. 4C1.b	1.b.8.h: Work as part of a team to design a product or service that could fulfill a human need or desire.
4C3: Students will communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.	
Work collaboratively with others. 4C3.b	3.b.9.h: Incorporate the use of technology to productively plan, implement and evaluate a solution, process or procedure.
Career Development (CD)	
CD1: Students will consider, analyze and apply an awareness of self, identity and culture to identify skills and talents.	
Identify person strengths, aptitudes and passions. CD1.a	1.a.3.h: Evaluate various occupations and career pathways to identify personal, academic and career goals based on personal strengths, aptitudes and passions.
CD2: Students will identify the connection between educational achievement and work opportunities in order to reach personal and career goals.	
Assess attitudes and skills that contribute to successful learning in school and across the life span. CD2.b	2.b.9.h: Analyze local and regional labor market and job growth information to select a career pathway for potential advancement.

Wisconsin Standards for Science (SCI)	
Life Science (LS)	
LS1: Students use science and engineering practices, crosscutting concepts, and an understanding of <i>structures and processes (on a scale from molecules to organisms)</i> to make sense of phenomena and solve problems.	
Growth and Development of Organisms LS1.B	LS1.B.h: Growth and division of cells in organisms occurs by mitosis and differentiation for specific cell types.
Organization for Matter and Energy Flow in Organisms LS1.C	LS1.C.h: The molecules produced through photosynthesis are used to make amino acids and other molecules that can be assembled into proteins or DNA. Through cellular respiration, matter and energy flow through different organizational levels of an organism as elements are recombined to form different products and transfer energy.
LS2: Students use science and engineering practices, crosscutting concepts, and an understanding of the <i>interactions, energy, and dynamics within ecosystems</i> to make sense of phenomena and solve problems.	
Interdependent Relationships in Ecosystems LS2.A	LS2.A.h: Ecosystems have carrying capacities resulting from biotic and abiotic factors. The fundamental tension between resource availability and organism populations affects the abundance of species in any given ecosystem. The combination of the factors that affect an organism's success can be measured as a multidimensional niche.
Cycles of Matter and Energy Transfer in Ecosystems LS2.B	LS2.B.h: Photosynthesis and cellular respiration provide most of the energy for life processes. Only a fraction of matter consumed at the lower level of a food web is transferred up, resulting in fewer organisms at higher levels. At each link in an ecosystem, elements are combined in different ways, and matter and energy are conserved. Photosynthesis and cellular respiration are key components of the global carbon cycle.
Ecosystem Dynamics, Functioning, and Resilience LS2.C	LS2.C.h: If a biological or physical disturbance to an ecosystem occurs, including one induced by human activity, the ecosystem may return to its more or less original state or become a very different ecosystem, depending on the complex set of interactions within the ecosystem.
LS3: Students use science and engineering practices, crosscutting concepts, and an understanding of <i>heredity</i> to make sense of phenomena and solve problems.	
Variation of Traits LS3.B	LS3.B.h: The variation and distribution of traits in a population depend on genetic and environmental factors. Genetic variation can result from mutations caused by environmental factors or errors in DNA replication, or from chromosomes swapping sections during meiosis.
LS4: Students use science and engineering practices, crosscutting concepts, and an understanding of <i>biological evolution</i> to make sense of phenomena and solve problems.	

Evidence of Common Ancestry and Diversity LS4.A	LS4.A.h: The ongoing branching that produces multiple lines of descent can be inferred by comparing DNA sequences, amino acid sequences, and anatomical and embryological evidence of different organisms.
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Key Vocabulary:			
Aquaculture	agronomy	parasites	progeny
ozone	aquifer	xylem	phloem
silviculture	Integrated Pest Management	incomplete dominance	fungicide
herbicide	taproot	fibrous	legume
cell division	internode	ruminants	monogastric
lactation	antibiotics	internal parasites	external parasites
homozygous	heterozygous	insecticide	sex-linked
parturition	gene splicing	gestation	progeny
heifer	bull	sows	boar
ewe	ram	mares	stallion

Topics/Content Outline- Units and Themes:

Content Outline:

- Agriscience in the Information Age
 - The Science of Living Things
 - Better Living Through Agriscience
- Soil Conservation and Management
- Natural Resource Management
 - Maintaining Air Quality
 - Water Conservation
 - Forestry Management
 - Wildlife Management
 - Aquaculture
- Integrated Pest Management
 - Biological, Cultural, Chemical Control of Pests
 - Safe Use of Pesticides
- Plant Sciences
 - Plant Structures and Taxonomy (end of 1st semester)
 - Plant Physiology
 - Plant Reproduction
 - Hydroponics
 - Indoor Plants

- Animal Sciences
 - o Animal Anatomy, Physiology and Nutrition
 - o Animal Health
 - o Genetics, Breeding and Reproduction
 - o Small Animal Care and Management
 - o Dairy and Livestock Management
- Food Science and Technology
 - o The Food Industry
 - o Food Science
 - o Biotechnology

Primary Resource(s):
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