

Agricultural Science

Introduction to Agriculture **(Grades 9 – 10) Year Long Course**

- Focus: The World of Agriculture
- Purpose: An introduction to the industry of agriculture that encompasses: food, fiber, and natural resources.
- Outcome: **IA.1** Students will understand the importance of the agricultural industry, identify careers, and explore the history of agriculture in our country. [1:C:4c](#), [12:B:4b](#)
- Components: **IA.1.1** – Discuss the role of modern agriculture in basic human nutrition.
IA.1.2 – Identify the agriculture products used to provide food, clothing and human shelter.
IA.1.3 – Identify important agricultural developments that occurred in early American history.
IA.1.4 – Explain major technological developments and identify trends that have led to the development of today’s agricultural society.
IA.1.5 – Identify and list possible occupations in the agriculture/horticulture industries.
IA.1.6 – Discuss factors to consider in selecting an occupation in the Agriculture Industry.
- Outcome: **IA.2** Students will understand the importance of, and identify opportunities in, the National FFA Organization. [18.B.3a](#), [4.B.I4](#), [18.B.I3](#)
- Components: **IA.2.1** – Describe the components of the agricultural education, FFA, and SAE model.
IA.2.2 – Identify various leadership concepts used in society.
IA.2.3 – Analyze the use of parliamentary procedure and identify its importance.
IA.2.4 – Explore historical events in the National FFA Organization.
- Outcome: **IA.3** Students will explore the agronomic industry which includes the soil science, plant science, and entomology. [12.B.J2](#), [12.E.I4](#), [12.C.J1](#), [12.B.I1](#), [12.A.J3](#), [12.A.I2](#), [12.A.I3](#), [12.A.4a](#)
- Components: **IA.3.1** – Examine different types of parent material and how climate effects the development of the soil.

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IA.3.2 – soil profile, soil erosion, fertilizer formulations, classify and name plants, propagating, manage insect plants.

IA.3.3 – Explain how business is aided by government.

Outcome: **IA.4** Students will examine the agribusiness arrangement types and basic agribusiness principles. [15.A.5a](#), [15.A.5c](#)

Components: **IA.4.1** – Analyze the pros and cons to owning your own business, setting up a cooperative, owning a partnership business, and owning a corporation.

IA.4.2 – Identify key strategies and important steps to having a successful entrepreneurship.

IA.4.3 – Identify and use key financial records that are used in a business.

IA.4.4 – Identify and understanding various agricultural companies.

Outcome: **IA.5** Students will identify and implement a Supervised Agricultural Experience Program (SAEP). [6.B.I.4](#), [13.A.J1](#), [11.A.5a](#), [15.C.I4](#), [1.C.I4](#)

Components: **IA.5.1** – Understand the importance of having a SAEP, identifying skills that could potentially be developed, and analyze student example SAEP's.

IA.5.2 – Examine and understand the key financial record pages of the SAEP such as the net worth statement, operating expenses, receipts, budgets, cash flow statements, and personal expenses.

IA.5.3 – Record all SAEP financial information by utilizing an electronic record book database called EZ Records.

IA.5.4 – Identify key steps and parts in planning an SAEP.

Outcome: **IA.6** Students will begin to develop an understanding of the animal science industry, basic principles of animal care, and indentify key components within the large and small companion animal sectors.
[12.A.I1](#), [12.A.J2](#), [12.A.I4](#), [12.B.I1](#), [12.B.I2](#)

Components: **IA.6.1** – Investigating the history of animal domestication, describe the important segments of the industry, and understand the importance of livestock production in our economy.

IA.6.2 – Analyze the ethics involved in animal production, compare and contrast animal rights and animal welfare, and investigate legislation related to the animal welfare.

IA.6.3 – Identify the scientific name of common livestock and companion animals.

IA.6.4 – Compare and contrast common breeds of beef, dairy, equine, swine, and companion animals.

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IA.6.5 – Identify common diseases and parasites of livestock and companion animals.

IA.6.6 – Recognize advantages and disadvantages of livestock production.

IA.6.7 – Identify key states and nations of livestock production and determine the major export and import markets for the United States.

Outcome: **IA.7** Students will explore the basic principles of horticulture, floral crops, landscaping, and develop skills used in those industry. [13.B.5e](#), [11.B.4d](#), [26.A.5a](#), [12.A.4b](#), [10.A.4a](#), [12.A.5a](#), [11.B.4c](#)

Components: **IA.7.1** – Define horticulture and describe its relationship to science and technology and differentiate the three major segments of the industry.

IA.7.2 – Differentiate greenhouse designs, review considerations of greenhouse frameworks, and identify greenhouse bench options.

IA.7.3 – Explain requirements of cut flowers, understand the causes of deterioration and death of flowers, and explain the importance of using floral preservatives.

IA.7.4 – Analyze the principles of floral design which include the concept of proportion, balance, rhythm, dominance, and focal points.

IA.7.5 – Analyze the residential landscape, putting the plan on paper, and identifying the characteristics of plants to choose for the landscaping area.

IA.7.6 – Classifying, identifying, and selecting turf grass.

IA.7.7 – Managing turf grass and identify and control its pests and diseases.

IA.7.8 – Explore the anatomy and physiology of a flower.

Outcome: **IA.8** Students will explore the area of environmental science including soil, water and air quality. [12.E.5e](#), [12.C.5a](#), [12.C.5b](#), [12.B.5a](#), [12.B.4a](#), [12.E.4b](#)

Components: **IA.8.1** – Identify and discuss the importance of soil quality and its impact on our society.

IA.8.2 – Identify key factors that degrade our soil, air, and water quality.

IA.8.3 – Determine the sources of our water and their quality standards.

IA.8.4 – Conduct water quality tests and track groundwater contamination.

IA.8.5 – Examine industrial air pollution.

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Biological Science Application in Agriculture (BSAA) - Animals *(Grades 11 – 12) Semester Class*

Focus: Animal Science

Purpose: Students will gain an in depth look into various scientific principles through agricultural applications in the animal science industry by developing and reinforcing their scientific skills.

Outcome: **BSAAA.1** Students will explore the agricultural laboratory, its equipment, and understand the principle of research. [11.B.4b](#), [12.A.4b](#), [11.A.5e](#), [12.A.4c](#), [13.B.5b](#), [11.A.4c](#), [13.A.4a](#)

Components: **BSAAA.1.1** – Discuss advancements made in agri-science through research.
BSAAA.1.2 – Understand the importance of the scientific method, the importance of controlled research, and explain the steps in conducting research.
BSAAA.1.3 – List hazards found in the lab, identify and properly use personal protection equipment, and describe the safety procedures to be used in the lab.
BSAAA.1.4 – Identify common equipment used in the BSAA lab, identify how to properly use a microscope, and explain the process in cleaning all equipment in the lab.

Outcome: **BSAAA.2** Students will gain an understanding of cellular biology in agriculture. [11.A.4b](#), [12.A.4a](#)

Components: **BSAAA.2.1** – Describe an animal cell's components and their functions.
BSAAA.2.2 – Describe the structure and function of the nucleus.
BSAAA.2.3 – Describe the structure of DNA and RNA
BSAAA.2.4 – Explain the steps involved in cellular replication.

Outcome: **BSAAA.3** Students will examine animal genetics and biotechnology. [SCI-11.A.4c](#), [SCI-12.A.4b](#), [SCI-13.B.5b](#), [SCI-12.A.4a](#), [SCI-13.A.4c](#)

Components: **BSAAA.3.1** – Define genetics, identify and explain key vocabulary, and explain why it is important to the agricultural society.
BSAAA.3.2 – Describe sex determination, linkage, crossover, and mutation
BSAAA.3.3 – Explain how to estimate the heritability of certain traits
BSAAA.3.4 – Explain the genetic information found in cells and understand how genes code for a single protein.

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BSAAA.3.4 – Discuss applications of molecular and organismic biotechnology.

Outcome: **BSAAA.4** Students will explore the concepts of growth and development of various livestock and companion animals, with specific emphasis on chickens. [SCI-11:A:4c](#), [SCI-12:A:4b](#), [SCI-12:B:4b](#), [SCI-13:A:5a](#), [SCI-12:A:5a](#), [SCI-13:A:4d](#)

Components: **BSAAA.4.1** – Identify the internal structure of an egg and the functions associated with each.

BSAAA.4.2 – Describe how fertilization takes place in an egg and the sequence of embryo development.

BSAAA.4.3 – Evaluate factors involving hatchability of eggs and describe ideal environment for incubating eggs artificially.

BSAAA.4.4 – Evaluating animal behavior by analyzing the pecking order of chicks.

BSAAA.4.5 – Understand the effects personality and size difference in animal behavior, identify particular animal behavior, and understand the importance of inbred behavior.

Outcome: **BSAAA.5** Students will analyze the concepts in animal health and basic animal nutrition practices. [SCI-11.A.4a](#), [SCI-11.A.4c](#), [SCI-12.A.5a](#), [SCI-13.A.4b](#), [SCI-13:A:4d](#), [SCI-11.A.5a](#), [SCI-12.A.4b](#), [SCI-11.A.5b](#), [SCI-12.A.5b](#)

Components: **BSAAA.5.1** – Discuss nutrients needs of animals for maintenance, growth, and reproduction.

BSAAA.5.2 – Identify chief sources of energy and symptoms of energy deficient diets.

BSAAA.5.3 – Describe chemical processes of breaking down food in the body and the role of enzymes in helping digest starches.

BSAAA.5.4 – Describe the environment of the stomach and its relation to protein digestion.

BSAAA.5.5 – Identify common disease common amongst animals at various stages of life.

BSAAA.5.6 – Discuss prevention methods that are used in the livestock and companion animal industry.

Outcome: **BSAAA.6** Students will develop an understanding of animal reproduction and identify common practices used for efficiency. [SCI-11.A.4c](#), [SCI-12.A.4b](#), [SCI-13.A.4a](#), [SCI-12.A.5a](#)

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Components: **BSAAA.6.1** – Identify the anatomy and physiology of male and female reproductive systems.

BSAAA.6.2 – Describe the importance of reproduction and list the phases of the estrous cycle.

BSAAA.6.3 – Explain and identify the advantages and disadvantages of artificial insemination and the technologies that are used in the process.

BSAAA.6.4 – Explain spermatogenesis and oogenesis and the factors used to evaluate them.

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Biological Science Application in Agriculture (BSAA) - Plants *(Semester Long Course)*

Focus: Plant Science

Purpose: Students will gain an in depth look into various scientific principles through agricultural applications in the plant science industry by developing and reinforcing their scientific skills.

Outcome: **BSAAP.1** Students will explore the agricultural laboratory, its equipment, and understand the principle of research. 11:B:4b, 12:A:4b, 11:A:5e, 12:A:4c, 13:B:5b, 11:A:4c, 13:A:4a

Components: **BSAAP.1.1** – Discuss advancements made in agri-science through research.
BSAAP.1.2 – Understand the importance of the scientific method, the importance of controlled research, and explain the steps in conducting research.
BSAAP.1.3 – List hazards found in the lab, identify and properly use personal protection equipment, and describe the safety procedures to be used in the lab.
BSAAP.1.4 – Identify common equipment used in the BSAA lab, identify how to properly use a microscope, and explain the process in cleaning all equipment in the lab.

Outcome: **BSAAP.2** Students will gain an understanding of cellular biology in agriculture. 11.A.4b, 12.A.4a

Components: **BSAAP.2.1** – Describe a plant cell's components and their functions.
BSAAP.2.2 – Describe the structure and function of the nucleus.
BSAAP.2.3 – Describe the structure of DNA and RNA
BSAAP.2.4 – Explain protein synthesis and the steps involved in cellular replication.
BSAAP.2.5 – Explain diffusion, osmosis, and osmotic potential.

Outcome: **BSAAP.3** Students will examine the world of genetics through the studies of Mendel and understand the importance that genetics plays in the agricultural industry. 11.A.4a, 12.A.4b, 13.A.4d, 12.C.4a, 13.A.4b, 11.A.4b

Components: **BSAAP.3.1** – Define genetics and explain why it is important to the agricultural society.
BSAAP.3.2 – Identify factors that govern genetics and how organisms reproduce

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BSAAP.3.3 – Identify and explain key vocabulary related to genetics such as alleles, genotype, phenotype, etc.

BSAAP.3.4 – Set up, solve, and determine probability of a monohybrid and dihybrid Punnett Square.

Outcome: **BSAAP.4** Students will identify the various components of initiating plant growth. 11.A.4b, 12.A.4b, 11.A.4c, 12.A.5a, 13.B.5c, 11.A.4a

Components: **BSAAP.4.1** – Explain the chain of events that occur during the germination process.

BSAAP.4.2 – Describe the source and function of amylase during seed germination.

BSAAP.4.3 – Explain the role of light, the importance of temperature, the effects of oxygen, the role of water, and role of planting depth on germination.

BSAAP.4.4 – Explain the cause of buildup of soluble salts in soils and its impact on seed germination.

BSAAP.4.5 – Understand how soil condition affects seed germination and demonstrate an understanding of how germinating seed work their way up through the soil.

Outcome: **BSAAP.5** Students will identify and describe the components necessary to manage proper plant growth. 11.A.5b, 12.B.4a, 13.B.5c, 13.B.4b, 11.A.4c, 12.A.4b

Components: **BSAAP.5.1** – Identify the importance of photosynthesis and discuss where the photosynthetic reaction occurs.

BSAAP.5.2 – Describe the process of photosynthesis and the factors that affect it.

BSAAP.5.3 – Describe the transpiration process, the factors that affect it, and explain water movement caused at the root level.

BSAAP.5.4 – Understand and identify plant growth regulators and plant hormones.

Outcome: **BSAAP.6** Students will examine reproduction in plants. 11.A.:4c, 12.A.4b, 13.A.4c

Components: **BSAAP.6.1** – Explain asexual and sexual propagation.

BSAAP.6.2 – Describe tissue culture and its importance.

BSAAP.6.3 – Explain the advantages of tissue culture over other propagation methods.

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BSAAP.6.4 – Identify the tissue culture method of propagation used in the greenhouse industry.

BSAAP.6.5 – Examine the anatomy of a flower.

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Veterinary Technology I & II (Two Semester Long Courses)

Focus: Veterinary Technology

Purpose: Students will gain an in depth look into various scientific principles through agricultural applications in the animal science industry by developing and reinforcing their scientific skills.

Outcome: **VT.1** Students will discuss and find solutions to tackle the safety and sanitation hazards that are common in veterinary hospitals. [13.A.5a](#)

Components: **VT.1.1** – Read a MSDS and locate important safety information in a given clinic.
VT.1.2 – Explain what OSHA is and describe its purpose in our society.
VT.1.3 – Analyze possible hazards within the four areas of safety hazards.
VT.1.4 – Conduct mathematical equations to determine chemical concentrations.

Outcome: **VT.2** Students will learn many common Greek and Latin prefixes, suffixes, and roots that compose the language of veterinary medicine.

Components: **VT.2.1** – Students will be able to analyze veterinary terms to define their meaning.
VT.2.2 – Students will recognize common Greek and Latin prefixes, suffixes, and roots.
VT.2.3 – Students will be able to list abbreviations commonly used in veterinary medicine.
VT.2.4 – Students will be able to dissect veterinary terms to discover the word’s meaning.

Outcome: **VT.3** Students will investigate the body systems and gain a working knowledge of how each system functions, its purpose, and how it is affected by disease.
[11.B.4c](#), [12.A.4c](#)

Components: **VT.3.1** – Recognize and implement common anatomical terminology.
VT.3.2 – Apply knowledge of veterinary anatomy through the dissection of animal specimens.
VT.3.3 – Describe the functions of the skeletal, muscular, circulatory, respiratory, and nervous systems.
VT.3.4 – Identify the structures of the heart, as well as major veins and arteries.

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Outcome: **VT.4** Students will gain practical knowledge of the methods used to assess an animal's health. [11.B.4g](#)

Components: **VT.4.1** – List temperature, pulse, and respiration rates for feline, canine, equine, and bovine.

VT.4.2 – Evaluate an animal's general health by completing a physical exam on the animal.

VT.4.3 – Describe the characteristics of a healthy animal and the signs and methods used to assess an unhealthy animal.

VT.4.4 – Communicate with others to obtain a history of an animal as part of a routine physical exam.

Outcome: **VT.5** Students will investigate common internal and external parasites of cats and dogs. [10.A.4a](#), [11.A.5a](#), [11.A.5b](#), [11.A.5c](#), [11.A.5d](#), [11.A.5e](#), [11.B.4g](#)

Components: **VT.5.1** – Properly set-up and use a microscope to scan for parasite eggs.

VT.5.2 – Perform common laboratory procedures for diagnosing parasites such as fecal floatation analysis.

VT.5.3 – Diagram the life cycle of internal and external parasites.

VT.5.4 – Describe the general clinical signs of an animal with a parasite infestation.

Outcome: **VT.6** Students will practice basic math skills and apply their knowledge to posology, math for veterinarians and veterinary technicians. [7.A.4b](#), [7.C.4c](#), [10.A.4a](#), [10.A.4b](#)

Components: **VT.6.1** – Evaluate a given word problem to identify the important information that will be used in solving the problem.

VT.6.2 – Complete word problems dealing with percent, temperature conversion, and liquid and linear measurement.

VT.6.3 – Complete advanced ratios dealing with dosage, dilution, and weight conversions.

Outcome: **VT.7** Students will explore various aspects of clinical hematology and gain practical experience performing several laboratory tests. [7.A.5](#), [11.A.4c](#), [11.A.5a](#), [11.A.5b](#), [11.A.5c](#), [11.A.5d](#), [12.A.4b](#)

Components: **VT.7.1** – Correctly prepare and stain a blood film.

VT.7.2 – Use a microscope and correctly identify the different types of blood cells.

VT.7.3 – Correctly perform a urinalysis.

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VT.7.4 – Prepare an antibiotic sensitivity test and read the results.

Outcome: **VT.8** Students will gain an understanding of the importance of animal nutrition in maintaining a healthy animal. [SCI-11.A.4a](#), [SCI-11.A.4c](#), [SCI-12.A.5a](#), [SCI-13.A.4b](#), [SCI-13:A:4d](#), [SCI-11.A.5a](#), [SCI-12.A.4b](#), [SCI-11.A.5b](#), [SCI-12.A.5b](#)

Components: **VT.8.1** – Conduct a food nutrients lab to identify the presence or absence of nutrients in various animal feeds.

VT.8.2 – Evaluate various food labels to determine the nutrient components and their quality.

VT.8.3 – Calculate dry matter of various feeds and balance a feed ration for a given crude protein level.

VT.8.4 – Know and explain the six basic nutrients and their function in maintaining healthy animals.

Outcome: **VT.9** Students will explain the signs of disease in an animal as compared to a healthy animal and discuss factors that influence the health of an animal. [12.A.5a](#), [13.B.5c](#)

Components: **VT.9.1** – List the factors that influence health and wellness.

VT.9.2 – Discuss factors that may cause the disease based on the environment around the animal.

VT.9.3 – Describe the signs and symptoms of the disease.

VT.9.4 – Explain how different diseases work and affect the body and the methods used to treat those diseases.

Outcome: **VT.10** Students will form an educated opinion of their stance on animal rights and welfare as well as explore the animal science industry. [1:C:4c](#), [11.A.5e](#), [12:B:4b](#), [13.B.4b](#), [13.B.5e](#)

Components: **VT.10.1** – Identify key issues of animal rights vs. welfare and prepare a debate against classmates on those issues.

VT.10.2 – Identify and list ways in which animals are a part of our society and how they are used for work.

VT.10.3 – Identify and list possible occupations in the agriculture/horticulture industries.

VT.10.4 – Discuss factors to consider in selecting an occupation in the Agriculture Industry.

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Biotechnology & Alternative Energy Year Long Course

- Focus: Biotechnology and Alternate Energy Sources
- Purpose: To provide an in depth look into the field of biotechnology and alternative sources of energy by exploring the following: wind, plants, soil, water, solar, hydrogen, electricity, and various biomasses.
- Outcome: **BTAE.1** Students will understand the importance of the agricultural industry, identify careers, and explore the history of agriculture in our country.
[1.C.4c](#), [12.B.4b](#)
- Components: **BTAE.1.1** – Discuss the role of modern agriculture in basic human nutrition.
BTAE.1.2 – Identify the agriculture products used to provide food, clothing and human shelter.
BTAE.1.3 – Identify important agricultural developments that occurred in early American history.
BTAE.1.4 – Explain major technological developments and identify trends that have led to the development of today’s agricultural society.
BTAE.1.5 – Identify and list possible occupations in the bioengineering and alternative energy sources industries.
BTAE.1.6 – Discuss factors to consider in selecting an occupation in the Agriculture Industry.
- Outcome: **BTAE.2** Students will explore introductory principles in biotechnology.
[11. A.5e](#), [12.A.4c](#), [13.B.5b](#)
- Components: **BTAE.2.1** – Describe biotechnology and genetic engineering.
BTAE.2.2 – Explain the differences between genetic engineering and traditional plant breeding.
BTAE.2.3 – Explain the steps in engineering a plant.
BTAE.2.4 – Explain how desirable genes are located.
BTAE.2.5 – Explain how selected genes are introduce into a target organism.
- Outcome: **BTAE.3** Students will explore biotechnology through the use of plants.
[1.C.4c](#), [12.B.4b](#), [11.A.5e](#), [12.A.4c](#), [13.B.5b](#)
- Components: **BTAE.3.1** – Explain how genetically engineered crops are tested.

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BTAE.3.2 – Explain the steps taken in conducting research in biotechnology.

BTAE.3.3 – Analyze the positive outcomes of a bioengineered crop.

BTAE.3.4 – Analyze the negative aspects of a bioengineered crop on society.

BTAE.3.5 – Analyze the negative aspects of a bioengineered crop on its surrounding ecosystem.

Outcome: **BTAE.4** Students will explore the bioengineering plant science industry.
[1.C.4c](#), [12.B.4b](#)

Components: **BTAE.4.1** – Identify American companies that use successful bioengineering techniques.

BTAE.4.2 – Compare and contrast each identified company’s strategies and research methods of their bioengineering program.

BTAE.4.3 – Identify specific plant species that are currently used in the industry.

BTAE.4.4 – Identify the positive and negative aspects of introducing a bioengineered plant into the commercial market.

BTAE.4.5 – Conduct a lab by inserting a targeted gene into a plant species that will benefit society.

Outcome: **BTAE.5** Students will discover fuel energy sources from corn.
[11.A.4c](#), [12.A.5a](#), [13.A.4c](#), [13.B.5b](#)

Components: **BTAE.5.1** – Explain and indentify the advantages of using fuels from crops.

BTAE.5.2 – Describe the chemical nature of ethanol.

BTAE.5.3 – Explain what renewable resources are used to create biofuels and why they are good sources of energy.

BTAE.5.4 – Explain the processes involved in fermentation and how organisms obtain energy.

BTAE.5.5 – Explain the steps of how ethanol is produced.

Outcome: **BTAE.6** Students will discover fuel energy sources from crops other than corn.
[11.A.4c](#), [12.A.5a](#), [13.A.4c](#), [13.B.5b](#)

Components: **BTAE.6.1** – Explain and indentify the advantages of using fuels from crops other than corn.

BTAE.6.2 – Describe the chemical nature of biodiesel.

BTAE.6.3 – Analyze the positives and negatives of using various biomass products to produce ethanol.

BTAE.6.4 – Compare the efficiency of ethanol produced of all biomass crops.

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BTAE.6.5 – Explain the steps of how biodiesel is produced.

BTAE.6.6 – Identify the five sources of how biodiesel is made and discuss each positive outcome from using each source for fuel.

Outcome: **BTAE.7** Students will explore the sources of energy used through wind power.
[11.A.5e](#), [11.B.4c](#), [12.B.4b](#), [12.D.5a](#), [12.D.5b](#), [13.A.4a](#), [13.B.4d](#), [13.B.5d](#)

Components: **BTAE.7.1** – Define wind power as an energy source.

BTAE.7.2 – Identify different types of windmills used and for their specific purposes.

BTAE.7.3 – Explain electricity and how electricity flows along a complete circuit.

BTAE.7.4 – Discuss the drawbacks of using wind energy.

BTAE.7.5 – Analyze different windmill design elements and experiment with these design principles by constructing a windmill that will light up a bulb and perform work (like a pump).

BTAE.7.6 – Test the effectiveness of various pulley designs.

BTAE.7.7 – Calculate the mechanical advantage of an inclined plane.

Outcome: **BTAE.8** Students will identify and understand principles used in solar power that include the study of photovoltaic cells in solar radiation.
[11.A.5a](#), [11.A.5e](#), [12.B.4b](#), [12.C.5b](#), [12.D.4b](#), [13.A.4a](#), [13.B.5d](#), [13.B.5e](#)

Components: **BTAE.8.1** – Define solar power as an energy source

BTAE.8.2 – Understand the difference between conduction and convection

BTAE.8.3 – Identify steps used in solar thermal energy to change the electromagnetic radiation into usable energy, such as an electromotive force.

BTAE.8.4 – Determine cost of heating versus cost of insulation.

BTAE.8.5 – Define geothermal energy and list the pros and cons of using it as a source of energy.

Outcome: **BTAE.9** Students will gain an understanding of an alternative energy source through the use of the water available in our society.
[11.A.5e](#), [11.B.5a](#), [12.B.4b](#), [12.C.4a](#), [13.B.5d](#)

Components: **BTAE.9.1** – Define water power as an energy source.

BTAE.9.2 – Identify and discuss the steps in the hydrologic cycle.

BTAE.9.3 – Analyze and evaluate efficiency of hydroelectric power and various models of hydroelectric facilities.

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BTAE.9.4 – Identify various water sources for use in energy.

BTAE.9.5 – Conducting and evaluating water tests that are used to identify most efficient water energy sources.

BTAE.9.6 – Determine the relationships between air moisture and evaporative cooling.

Outcome: **BTAE.10** Students will synthesize all information given on each unit discussed in class and solve real world problems pertaining to the current subject matter topic. [11.B.5a](#), [12.D.5a](#), [13.B.4d](#)

Components: **BTAE.10.1** – Define efficiency, performance efficiency, mechanical efficiency, and field efficiency.

BTAE.10.2 – Identify field capacity and effective field capacity and the relationship between them.

BTAE.10.3 – Explain how efficiencies are determined and how they are used to size and select machinery and equipment for production of energy.

BTAE.10.4 - Set up, conduct, and analyze the efficiency of an effective biofuels lab that will produce viable ethanol to run in an automobile.

BTAE.10.5 – Set up, conduct, and analyze the efficiency of an effective windmill that will produce enough electricity to light up a bulb.

BTAE.10.6 – Set up, conduct, and analyze the efficiency of an effective solar thermal box lab that will produce enough heat to change the box's temperature.

BTAE.10.7 – Set up, conduct, and analyze the efficiency of an effective hydrogen powered car lab.