

**Boulder Valley School District
Sustainability Curriculum Guide
2010**



National Standards

Sustainability in the Boulder Valley School District curriculum is addressed through an interdisciplinary lens, which touches multiple content areas. While Colorado Standards do not currently exist for Environmental Education, the North American Association for Environmental Education (NAAEE) has published guidelines for learners which are organized by four strands (<http://www.naaee.org/programs-and-initiatives/guidelines-for-excellence/materials-guidelines/learner-guidelines-strands>)

North American Association for Environmental Education (NAAEE) Guidelines

<p>Strand 1- Questioning, Analysis and Interpretation Skills</p> <ul style="list-style-type: none"> • Questioning • Designing Investigations • Collecting information • Evaluating accuracy and reliability • Organizing information • Working with models and simulations • Drawing conclusions and developing explanations 	<p>Strand 2- Knowledge of Environmental Processes and Systems</p> <ul style="list-style-type: none"> • The earth as a physical system <ul style="list-style-type: none"> • Processes that shape the earth • Changes in matter • Energy • The living environment <ul style="list-style-type: none"> • Organisms, populations, and communities • Heredity and evolution • Systems and connections • Flow of matter and energy • Humans and their societies <ul style="list-style-type: none"> • Individuals and groups • Culture • Political and economic systems • Global connections • Change and conflict • Environment and society <ul style="list-style-type: none"> • Human/environment interactions • Places • Resources • Technology • Environmental Issues
<p>Strand 3- Skills for Understanding and Addressing Environmental Issues</p> <ul style="list-style-type: none"> • Skills for analyzing and investigating environmental issues <ul style="list-style-type: none"> • Identifying and investigating issues • Sorting out the consequences of issues • Identifying and evaluating alternative solutions and courses of action <ul style="list-style-type: none"> • Working with flexibility, creativity, and openness • Decision-making and citizenship skills <ul style="list-style-type: none"> • Forming and evaluating personal views • Evaluating the need for citizen action • Planning and taking action • Evaluating the results of actions 	<p>Strand 4- Personal and Civic Responsibility</p> <ul style="list-style-type: none"> • Understanding societal values and principles • Recognizing citizen' rights and responsibilities • Recognizing efficacy • Accepting personal responsibility

BVSD Curriculum Essentials

<http://bvsd.org/curriculum/curriculum/Pages/default.aspx>

BVSD Curriculum Essentials were revised in every content area in June 2009. Sustainability is represented throughout the curriculum, with the most significant connections occurring in science. Specific alignments between the NAEE Standards and the BVSD Science curriculum will be addressed in detail in the next section. The following are brief descriptions of the broad overlaps between sustainability and curricular areas in BVSD.

Health

Health education in BVSD supports Environmental Education by helping students to acquire the skills to make good decisions and to communicate respectfully.

Language Arts

The Language Arts curriculum in BVSD supports students' development of the skills necessary to communicate, analyze, evaluate, and synthesize information about sustainability through reading, writing, speaking, and listening.

Mathematics

Mathematics in BVSD supports Environmental Education and sustainability throughout the PK-12 learning process through the study of data analysis. In particular, students are taught to collect, organize, interpret, evaluate and make decisions from data which supports Strand 1: Questioning, Analysis and Interpretation Skills of the North American Association for Environmental Education (NAAEE) Guidelines.

Social Studies

Social Studies in BVSD supports Environmental Education and sustainability by helping students develop an understanding of humans and their societies, including political and economic systems, global connections, change and conflict. The BVSD Social Studies curriculum also encourages development of a sense of civic responsibility.


World Language

The World Language curriculum in BVSD is designed to provide students with the necessary skills to communicate across political and cultural boundaries about issues related to global sustainability.

Science

The BVSD Science K-12 Curriculum Essentials are framed by seven enduring understandings, one of which is intended to set the stage directly for students to explore issues of sustainability – “Benefits and costs of scientific research and technological innovation include consequences that are long-term as well as short-term, and indirect as well as direct.”

Science Kindergarten

 **Sustainability link:** Understanding the basic needs of organisms and how they meet those needs is necessary foundational knowledge for students to understand the consequences for natural systems when environmental change impacts resource availability. *What happens to a tree when it does not have enough water?*

NAAEE Strand 2- Knowledge of Environmental Processes and Systems – the living environment

- BVSD: Explains how organisms (plants and animals) interact with each other and with non-living parts of their habitat to meet their basic needs
- BVSD: Identifies the basic needs of most living things (water, food, air, shelter, space)

 **Key materials:** *FOSS Animals 2x2, FOSS Trees*

Science Grade One

 **Sustainability link:** In first grade, students explore different types of Earth’s materials in *FOSS Pebbles Sand and Silt*. This kit presents opportunities to talk about the fact that humans use a variety Earth’s materials for activities such as construction and growing food. *How do humans use and reuse limited resources such as soil and water?*

NAAEE Strand 2- Knowledge of Environmental Processes and Systems – the living environment


- BVSD: Describes the basic needs, structures and life cycles of plants

NAAEE Strand 2- Knowledge of Environmental Processes and Systems – the earth as a physical system

- BVSD: Explain that there are different types of Earth’s materials that come in different shapes and sizes and have varied uses.
- BVSD: Describe how humans use and reuse a variety of Earth’s materials (for example: rocks, soil and water).

 **Key materials:** *FOSS New Plants, FOSS Pebbles Sand and Silt*

Science Grade Two


 Sustainability link: Understanding the basic needs of organisms and how they meet those needs is necessary foundational knowledge for students to understand the consequences for natural systems when environmental change impacts resource availability. *What would happen if honeybees or other insect pollinators disappeared from an ecosystem?*

NAAEE Strand 2- Knowledge of Environmental Processes and Systems – the living environment

- BVSD: Describes the basic needs, structures and life cycles of animals (insects)

 Key materials: *FOSS Insects*

Science Grade Three


 Sustainability link: In third grade, students formally explore energy sources for the first time. Understanding that energy occurs in different forms and comes from a variety of different sources serves as a foundation for understanding the difference between renewable and nonrenewable energy sources in later grades. *Where does energy come from?*

NAAEE Strand 2- Knowledge of Environmental Processes and Systems – the earth as a physical system

- BVSD: Identifies various types of energy and common sources of these types of energy

 Key materials: *FOSS Matter and Energy*

Science Grade Four

 Sustainability link: In fourth grade, students continue to explore energy. They also study the properties of water and the water cycle – providing a great opportunity to explore issues of water conservation. *Why is water important, and what can we do to use water resources sustainably?* Excellent materials are available from the City of Boulder at

http://www.bouldercolorado.gov/index.php?option=com_content&view=article&id=5604&Itemid=2425

NAAEE Strand 2- Knowledge of Environmental Processes and Systems – the earth as a physical system

- BVSD: Give examples of devices that use electrical energy to produce light, heat, sound, and magnetic effects.

NAAEE Strand 2- Knowledge of Environmental Processes and Systems – the living environment

- BVSD: Explains that all organisms need energy to survive and that they obtain this energy in different ways

 Key materials: *FOSS Magnetism and Electricity, FOSS Structures of Life, FOSS Water, My Water Comes from the Mountains (optional kit)*

Science Grade Five

 Sustainability link: Students explore the interconnectedness of organisms and their environment through the *Food Chains and Webs* kit.

NAAEE Strand 2- Knowledge of Environmental Processes and Systems – the living environment


- BVSD: Explain the interaction and interdependence between and among nonliving and living components of ecosystems.
- BVSD: Identify and describe the influence of nonliving components on living components of an ecosystem.
- BVSD: Trace the flow of energy through food chains and food webs.
- BVSD: Accurately draw and label a simple food chain using the following words: producers, consumers, decomposers.
- BVSD: Describe and/or represent the role of organisms in decomposition and recycling.

NAAEE Strand 2- Knowledge of Environmental Processes and Systems – the earth as a physical system

- BVSD: Explains that natural resources can be conserved, recycled, and depleted
- BVSD: Explains the benefit of recycling, reducing, and reusing Earth's resources
- BVSD: Identifies Earth's different natural resources and their uses
- BVSD: Recognizes and compares renewable and non renewable resources

 Key materials: *Delta Food Chains and Webs, FOSS Landforms*

Middle level Physical Science

 **Sustainability link:** Students explore the concept of renewable and non-renewable energy in depth. Additional free online resources can be obtained from the National Energy Education Development Project at <http://www.need.org/curriculum.php>

NAAEE Strand 2- Knowledge of Environmental Processes and Systems - the earth as a physical system


- BVSD: Identify renewable and non-renewable sources of energy.
- BVSD: Compare and contrast renewable and non-renewable energy sources.
- BVSD: Predict advantages and disadvantages of using both types of energy resources and their sustainability.

NAAEE Strand 3- Skills for Understanding and Addressing Environmental Issues -- Skills for analyzing and investigating environmental issues

- BVSD: Recognize that the interrelationship of science and technology has implications on the social, cultural, economic, and ecological systems within which we live.
- BVSD: Give examples of how human activity, including scientific studies and technological advancement can have both positive and negative effects on the natural world.

 **Key materials:** *STC Properties of Matter, STC Energy Machines and Motion, Prentice Hall Science Explorers*

Middle level Life Science


 **Sustainability link:** Students explore the interactions of organisms and their environment in depth, including human impacts on the environment.

NAAEE Strand 2- Knowledge of Environmental Processes and Systems – the living environment

- BVSD: Analyzes implications of interactions among organisms, populations, and their environment.
- BVSD: Describe several factors that could limit the size of a population.
- BVSD: Describe the impact of humans on the environment and how that affects the survival of populations and entire species.
- BVSD: Describe how organisms change in response to environmental factors.

 **Key materials:** *STC Organisms Macro to Micro, Prentice Hall Science Explorers*

Middle level Earth Science


 Sustainability link: Students explore the phenomenon of climate change and how the Earth as an evolving and dynamic system supports life.

NAAEE Strand 2- Knowledge of Environmental Processes and Systems - the earth as a physical system

- BVSD: Identify the factors affecting climate change over time.
- BVSD: Describe how water changes physical states as it circulates through and within the Earth's crust, oceans, and atmosphere.
- BVSD: Explain the processes and relationships that connect elements of the water cycle.
- BVSD: Interpret an illustration of the water cycle that includes ground water, glaciers, oceans, rivers, and the atmosphere.
- BVSD: Describe conditions that affect the rates of evaporation and condensation.

 Key materials: *STC Catastrophic Events, STC Earth and Space, Prentice Hall Science Explorers*


High School Physical Science

 Sustainability link: In 9th grade, students start to explicitly explore the costs and benefits of technology and resource use.

NAAEE Strand 3- Skills for Understanding and Addressing Environmental Issues -- Skills for analyzing and investigating environmental issues

- BVSD: Understand interrelationships among science, technology, and human activity and how they can affect the world.
- BVSD: Analyze the effects of technology and human activity on the natural world and the progression of scientific knowledge.
- BVSD: Analyze benefits, limitations, costs, and consequences involved in using technology or resources (eg., X-rays, agricultural chemicals, natural gas reserves).

High School Earth Space and Geophysical Science

 **Sustainability link:** This course has significant sustainability content as it explores a variety of Earth's subsystems including the oceans and atmosphere.

NAAEE Strand 2- Knowledge of Environmental Processes and Systems - the earth as a physical system

- BVSD: Describe how the use of Earth's resources impacts Earth's subsystems.
- BVSD: Describe the formation of fossil fuels, including petroleum and coal.
- BVSD: Compare and contrast renewable and nonrenewable resources in terms of advantages and disadvantages.
- BVSD: Analyze data about the effect of resource consumption and development on resource reserves to draw conclusions about sustainable use.
- BVSD: Analyze the economics of resources from discovery to disposal, including technological advances, resource type and concentration, waste disposal and recycling, and environmental costs.
- BVSD: Describe how the hydrosphere and atmosphere subsystems interact on various time scales.
- BVSD: Identify and explain the natural factors within the hydrologic cycle that influence the quality and amount of water.
- BVSD: Identify and explain the interaction of water within all Earth's systems at both the global and regional levels.
- BVSD: Quantify the components and fluxes within the hydrosphere, such as melting of polar ice caps, salt water incursion, and groundwater level in response to precipitation events or excessive pumping.
- BVSD: Analyze the empirical relationship, including measurement uncertainties, between the emissions of carbon dioxide, atmospheric carbon dioxide levels, and the average global temperature over the past 150 years.
- BVSD: Discuss mechanisms, such as atmospheric carbon dioxide concentration, major volcanic eruptions, changes in solar luminance, giant meteorite impacts, and human activities that result in significant changes in Earth's climate.
- BVSD: Explain how the Earth's global ocean, powered by the Sun, affects weather and climate through complex atmospheric interactions.
- BVSD: Analyze the uneven distribution of solar energy on Earth's surface, including differences in atmospheric transparency, surface albedo, latitudinal


angle of incidence, tilt of the Earth, duration of insolation, and differences in atmospheric and surface absorption of energy.

- BVSD: Compare and contrast weather and climate and variables that affect these.
- BVSD: Describe how the atmosphere is heated from Earth's surface due to its absorption of solar energy which is subsequently re-radiated as heat energy and then trapped by selective absorbers.
- BVSD: Explain how heat-transfer between the ocean and the atmosphere drives processes such as surface currents, thermohaline currents, and evaporation, and influences global and regional climates.
- BVSD: Predict the effects in ocean current changes on weather and climate.
- BVSD: Analyze and interpret data of influential weather factors and their effects on climate and ecosystems (for example: el niño and la niña).

NAAEE Strand 3- Skills for Understanding and Addressing Environmental Issues -- Skills for analyzing and investigating environmental issues

- BVSD: Understand interrelationships among science, technology, and human activity and how they can affect the world.
- BVSD: Analyze the effects of technology and human activity on the natural world and the progression of scientific knowledge.
- BVSD: Analyze benefits, limitations, costs, and consequences involved in using technology or resources (e.g. natural gas reserves).
- BVSD: Analyze how the introduction of a new technology has affected or could affect human activity (eg., nuclear energy, biofuels, and other alternative energy sources).
- BVSD: Gives an example of the interrelationships between science and technology (e.g., how do both science and technology influence a cost-benefit analysis of using a given energy source).

High School Biology

 **Sustainability link:** In this course, students explore the concepts of environmental sustainability on a global scale through the lens of biodiversity and ecosystem stability.


NAAEE Strand 2- Knowledge of Environmental Processes and Systems – the living environment

- BVSD: Understand how the introduction of biotechnology has affected or could affect humans and other organisms, and understand how human attitudes and values have impacted the development and introduction of new biotechnology.
- BVSD: Demonstrate understanding of the complex interactions among organisms and their environments and the implications of these interactions for biodiversity.
- BVSD: Predict what might happen to the biodiversity of an ecosystem if a change occurs in the ecosystem.
- BVSD: Describe environmental changes that could result from human actions in an ecosystem.
- BVSD: Describe the relationship between biodiversity and ecosystem stability and resiliency.

NAAEE Strand 3- Skills for Understanding and Addressing Environmental Issues -- Skills for analyzing and investigating environmental issues

- BVSD: Explain interrelationships among science, technology, and human activity and how they can affect the world.
- BVSD: Analyze the effects of technology and human activity on the natural world.
- BVSD: Analyze benefits, limitations, and consequences involved in using technology and consuming resources (e.g., X-rays, genetically modified organisms, alternative energy sources).
- BVSD: Analyze how the introduction of a new technology has affected or could affect human activity (e.g., invention of microscope and applications of biotechnology).
- BVSD: Give an example of the interrelationships between science and technology (e.g., electron microscopes revealed structure of viruses and cellular organelles).


High School Chemistry

 Sustainability link: In this course, students continue to consider the costs and benefits of technology and resource use.

NAAEE Strand 3- Skills for Understanding and Addressing Environmental Issues -- Skills for analyzing and investigating environmental issues

- BVSD: Understand interrelationships among science, technology, and human activity and how they can affect the world. (5.6)
- BVSD: Analyze the effects of technology and human activity on the natural world and the progression of scientific knowledge. (5.6.a)
- BVSD: Analyze benefits, limitations, costs, and consequences involved in using technology or resources (eg., X-rays, agricultural chemicals, natural gas reserves).
- BVSD: Analyze how the introduction of a new technology has affected or could affect human activity (for example: nanotechnology, bio-fuels, fuel cells).

High School Physics

 Sustainability link: In this course, students continue to consider the costs and benefits of technology and resource use.

NAAEE Strand 3- Skills for Understanding and Addressing Environmental Issues -- Skills for analyzing and investigating environmental issues

- BVSD: Understand interrelationships among science, technology, and human activity and how they can affect the world.
- BVSD: Analyze the effects of technology and human activity on the natural world and the progression of scientific knowledge.
- BVSD: Analyze benefits, limitations, costs, and consequences involved in using technology or resources (e.g., X-rays).