

***School in the Clouds* and Education Standards**

Hawk Mountain's *School in the Clouds* program introduces students to raptors, their migration, and the scientific study of these organisms. Students learn where raptors fit in the animal kingdom and in the environments in which they exist. This inquiry-based program asks students to take on the role of field biologists who study the migration behavior of raptors. These field trips enhance school curriculum by giving ecological understanding learned in the classroom a real-world practical context. Students apply this understanding in the field at Hawk Mountain Sanctuary. During the field experience, students learn about the geology, geography and natural communities that surround them.

Pre-visit lessons in the classroom build a bridge between Pennsylvania content standards and Hawk Mountain Sanctuary, and prepare students for a field trip experience. Post-visit lessons synthesize the practical field trip experience into measurable learning.

Hawk Mountain's *School in the Clouds* program **best** supports the PA Department of Education Curriculum Framework and Content Standards in the following areas.

Environment and Ecology

Big Ideas

Living things depend on their habitat to meet their basic needs.

Aquatic, terrestrial and human-made ecosystems consist of diverse living and non-living components that change over time and across geographic areas.

The survival of living things is dependent upon their adaptations and ability to respond to natural changes in and human influences on the environment.

Essential Questions

What conditions need to be met in order for an organism to survive in its environment?

How do changes in the environment affect the ability of living things to meet their basic needs?

How do the living and nonliving parts of ecosystems interact and change over time?

How do organisms survive in their environment?

How do the characteristics of organisms affect their ability to survive when change occurs in their environment?

How do adaptations enable an organism to survive?

What factors affect an organism's ability to meet its needs?

How is the survival of species and their ability to adapt affected by natural and human induced environmental changes?

How do changes within living and non-living components of aquatic, terrestrial and human systems affect the balance within and between them?

When investigating different systems (e.g., agriculture, terrestrial, aquatic), how does a habitat meet the needs of a species?

Concepts

(3-12 Grade) (Ascending order)

All living things depend directly or indirectly on air, water and soil.

Living things depend on other living things in their environment for survival.

Changes in the environment may affect the survival of living things in that environment.

The survival of living things is affected by changes in the food, water, shelter and space available to them.

Living things adapt to changing environmental conditions or they may become extinct.

Laws and regulations exist to help protect organisms from becoming extinct.

Technological resources may be used to aid an organism's survival.

Plants and animals in an ecosystem have physical and behavioral responses to seasonal change.

Habitat change affects organisms.

An organism must be able to adapt to changes in the environment or move to another location, otherwise it will die.

Organisms have physical and behavioral adaptations that enable them to survive in their habitat. (e.g., physical ó shape of beaks, thickness of fur or fat, flat leaf vs needle; behavioral ó migration, hibernation, playing dead).

The parts and characteristics of organisms (e.g. feathers, hibernation, leaf size) affect the ways they meet their needs in different environments (e.g. wetlands, forests, ocean).

Characteristics of organisms are inherited from their parents.

Organisms are made of parts and have characteristics that make them similar and different.

Organisms have basic needs for survival.

Habitat loss affects both the interaction among species and the population of a species.

Predator/prey relationships have a role in an ecosystem.

Producers, consumers and decomposers have niches in an ecosystem.

Energy flows through a food web within an ecosystem.

Plants and animals are uniquely adapted to their environment.

Adaptations develop over time and are passed from one generation to the next.

One species may adapt to environmental change while another may not, making it more susceptible to becoming endangered.

Species can be classified as threatened, endangered, and extinct.

Animal populations change over time.

Habitats can be lost or altered through natural processes or human activities.

Specific habitat management practices influence the success or failure of species

Scientists use specific criteria to categorize organisms as threatened, endangered or extinct.

Organisms within an ecosystem interact with other biotic components, abiotic components and within populations.

Every living organism is uniquely suited to fulfill a role within its ecosystem.

Species must be able to adapt to changes within their ecosystem in order to survive.

The degree of specialization of a species can cause it to become threatened, endangered, or extinct.

Animal species can be classified as generalists or specialists in their eating habits.

Habitat destruction can lead to species loss or termination.

The intervention of humans has influenced the survival of species through management practices.

Human endeavors and changes in natural cycles have caused species to become threatened, endangered, or extinct.

Every living organism is uniquely suited to fulfill a role within its ecosystem.

Competencies

(3-12 Grade) (Ascending order)

Identify ways living things and non-living things contribute to the survival of living things in their environment.

Explain how an organism may respond/adapt to changes in its food, water, shelter or space.

Explain why laws and regulations exist to help prevent extinction and give examples.

Identify a technological resource that can be used to aid the survival of a living organism.

Explain how seasonal changes affect the organisms in a local ecosystem.

Explain how the characteristics of an organism determine where it lives and how it survives in its environment.

Explain how a particular change in the environment can affect the survival of an organism in that environment.

Identify and explain the physical and behavioral characteristics of organisms that enable them to survive in their habitats.

Describe how inherited characteristics help organisms survive in their habitats.

Describe the response of organisms to environmental changes and how those changes affect survival (e.g., habitat loss, climate change).

Describe the flow of energy within an ecosystem.

Discuss how one species may adapt to environmental change while another may not.

Compare and contrast organisms with very specific needs with those organisms that have more general requirements.

Use evidence to explain factors that affect changes in populations. (e.g., deforestation, disease, land use).

Explain predator/prey relationships and the unique roles of producers/consumers and decomposers.

Explain in detail the complex interactions that occur among biotic and abiotic components within an ecosystem.

Explain how adaptations, degree of specialization, and behavior of organisms affect the niche they fill within their ecosystem.

Explain how specialization and generalization influence a species's survival.

Analyze how human attempts at species management have influenced the species's success or failure.

Describe how a species's adaptability determines its ability to survive rapid environmental changes due to human activities.

Science

Big Ideas

Different characteristics of plants and animals help some populations survive and reproduce in greater numbers.

All living things are made of parts that have specific functions.

Populations of organisms evolve by natural selection.

Essential Questions

How does the variation among individuals affect their survival?

How do the structures and functions of living things allow them to meet their needs?

How does the variation among individuals affect their survival?

What allows some populations of organisms to change and survive while others cannot?

Concepts (3-12 Grade) (Ascending order)

Individuals of the same kind differ in their characteristics, and sometimes the differences give individuals an advantage in surviving and reproducing, creating a population with survival and reproductive advantages.

Organisms inherit characteristics from their parents.

Each plant or animal has different structures that serve different functions in growth, survival, and reproduction.

Most living things need food, water, light, air, and a way to dispose of wastes.

Energy is needed for all organisms to stay alive and grow.

Living things can be grouped based on their similarities and differences.

Tools make it possible to observe living things or the parts of living things that are too small to be seen with the naked eye.

Individual organisms with certain traits are more likely than others to survive and have offspring

Organisms reproduce and pass their genes to the next generation (their offspring).

Changes in environmental conditions can affect the survival of populations and entire species.

Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival.

There are structural and functional similarities and differences that characterize diverse living things.

Competencies (3-12 Grade) (Ascending order)

Measure, describe, or classify organisms, objects and/or materials by basic characteristics, their changes, and their uses.

Describe relationships among parts of a natural or human-made system.

Identify examples of the relationship(s) between structure and function in the living world.

Geography

Big Ideas

Physical processes shape patterns of the Earth's surface, including the characteristics and spatial distribution of ecosystems.

Places and regions have physical and human characteristics, and one's culture and experiences may influence perception of place.

Essential Questions

Why are the physical processes of the Earth critical to the study of physical geography?

What are the physical characteristics of place?

What makes one place different from another?

How is one place different than another place?

Concepts

Earth-Sun relations affect conditions on Earth.

Humans interact with, and can change, ecosystems.

Spatial distribution of population changes over time.

Geographic representatives are used to acquire, process, and report information from a spatial perspective.

Competencies

Explain how Earth's position, relative to the Sun, affects events and conditions on Earth.

Evaluate the impact of migration on population distribution.

Evaluate the advantages and disadvantages of using maps, other geographic tools, and supporting technologies to illustrate data.

What are the physical characteristics of place?

Why are the physical processes of the Earth critical to the study of physical geography?

What are the physical characteristics of place?

Hawk Mountain's *School in the Clouds* program **best** supports the following PA Department of Education Content Standards.

Grades K-4

Environment & Ecology

Science as Inquiry

- Ask questions about objects, organisms, and events.
- Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known.
- Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.
- Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information.

Ecology

The Environment

- **4.1.4.A.** Explain how living things are dependent upon other living and non-living things for survival
 - Explain what happens to an organism when its food supply, access to water, shelter, or space (niche/habitat) is changed.
 - Identify similarities and differences between living organisms, ranging from single-celled to multi-cellular organisms through the use of microscopes, video, and other media

Biodiversity

- **4.5.4.D.** Explain how specific adaptations can help organisms survive in their environment

Grades 5-7

Environment & Ecology

Science as Inquiry

- Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions
- Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations
- Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations

Ecology

The Environment

- **4.1.7.A.** Describe the relationships between biotic and abiotic components of an ecosystem
 - Compare and contrast different biomes and their characteristics
 - Describe symbiotic and predator/prey relationships

Biodiversity

- **4.5.5.D.** Explain the differences between threatened, endangered, and extinct organisms
- **4.5.6.D.** Identify reasons why organisms become threatened, endangered, and extinct
- **4.5.7.D.** Explain how biological diversity relates to the viability of ecosystems
 - Compare and contrast monoculture with diverse ecosystems
 - Explain how biological diversity relates to the ability of an ecosystem to adapt to change
 - Explain how an adaptation is an inherited, structure, function, or behavior that helps and organism survive and reproduce

Grades 8-10

Environment & Ecology

Science as Inquiry

- Know that both direct and indirect observations are used by scientists to study the natural world and universe
- Identify questions and concepts that guide scientific investigations

Ecology

The Environment

- **4.1.10.A.** Examine the effects of limiting factors on population dynamics
 - Analyze possible causes of population fluctuations
 - Explain the concept of carrying capacity in an ecosystem
 - Describe how organisms become classified as threatened or endangered
 - Describe how limiting factors cause organisms to become extinct

Biodiversity

- **4.5.10.D.** Research practices that impact biodiversity in specific ecosystems
 - Analyze the relationship between habitat changes to plant and animal population fluctuations

Grades 11-12

Environment & Ecology

Science as Inquiry

- Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution.

Ecology

The Environment

- **4.1.12.A.** Analyze the significance of biological diversity in an ecosystem.
 - Explain how species adapt to limiting factors in an ecosystem
 - Analyze the differences between natural causes and human causes of extinction
 - Research wildlife management laws and their effects on biodiversity

Biodiversity

- **4.5.12.D.** Analyze the effects of new and emerging technologies on biodiversity in specific ecosystems
 - Evaluate the impact of laws and regulations on reducing the number of threatened and endangered species.

Grades K-4

Science and Technology and Engineering Education

Science as Inquiry

- Ask questions about objects, organisms, and events.
- Understand that all scientific investigations involve asking and answering questions and comparing the answer with what is already known.
- Plan and conduct a simple investigation and understand that different questions require different kinds of investigations.
- Use simple equipment (tools and other technologies) to gather data and understand that this allows scientists to collect more information than relying only on their senses to gather information.

Organisms and Cells

Common Characteristics of Life

- **3.1.3.A1.** Describe characteristics of living things that help to identify and classify them
- **3.1.4.A1.** Classify plants and animals according to the physical characteristics that they share

Evolution

Natural Selection

- **3.1.3.C1.** Recognize that many plants and animals can survive harsh environments because of seasonal behaviors (e.g. hibernation, migrations, trees, shedding leaves)
- **3.1.4.C1.** Identify different characteristics of plants and animals that help some populations survive and reproduce in greater numbers. Describe how environmental changes can cause extinction in plants and animals

Adaptation

- **3.1.3.C2.** Describe animal characteristics that are necessary for survival
- **3.1.4.C2.** Describe plant and animal adaptations that are important to survival

Grades 5-7

Science and Technology and Engineering Education

Science as Inquiry

- Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions
- Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations
- Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection

Organisms and Cells

Common Characteristics of Life

- **3.1.7.A1.** Describe the similarities and differences of physical characteristics in diverse organisms

Energy

- **3.1.7.A2.** Describe how organisms obtain and use energy throughout their lives

Evolution

Adaptation

- **3.1.7.C2.** Explain why the extinction of a species may occur when the environment changes

Grades 8-10

Science and Technology and Engineering Education

Science as Inquiry

- Know that both direct and indirect observations are used by scientists to study the natural world and universe

Grades 11-12

Science and Technology and Engineering Education

Science as Inquiry

- Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution

Organisms and Cells

Energy Flow

- Evaluate how organisms must derive energy from their environment or their food in order to survive

Grades K-4

Geography

Basic Geographic Literacy

Locations of Places and Regions

- **7.1.3.B.** Identify and locate places and regions as defined by physical and human features
- **7.1.4.B.** Describe and locate places and regions as defined by physical and human features

Physical Characteristics of Places and Regions

Physical Characteristics

- **7.2.3.A.** Identify the physical characteristics of places and regions
- **7.2.4.A.** Identify the physical characteristics of places and regions

Physical Processes

- **7.2.3.B.** Identify the basic physical processes that affect the physical characteristics of places and regions
- **7.2.4.B.** Identify the basic physical processes that affect the physical characteristics of places and regions

Grades 5-7

Geography

Basic Geographic Literacy

Locations of Places and Regions

- **7.1.5.B.** Describe and locate places and regions as defined by physical and human features
- **7.1.6.B.** Describe and locate places and regions as defined by physical and human features
- **7.1.7.B.** Explain and locate places and regions as defined by physical and human features

Physical Characteristics of Places and Regions

Physical Characteristics

- **7.2.5.A.** Describe the characteristics of places and regions
- **7.2.6.A.** Describe the characteristics of places and regions
- **7.2.7.A.** Explain the characteristics of places and regions

Physical Processes

- **7.2.5.B.** Identify the basic physical processes that affect the physical characteristics of places and regions
- **7.2.6.B.** Describe the physical processes that shape patterns on Earth's surface
- **7.2.7.B.** Describe the physical processes that shape patterns on Earth's surface

Grades 8-10

Geography

Basic Geographic Literacy

Locations of Places and Regions

- **7.1.8.B.** Explain and locate places and regions as defined by physical and human features
- **7.1.9.B.** Explain and locate regions and their shared connections as defined by physical and human features

Physical Characteristics of Places and Regions

Physical Characteristics

- **7.2.8.A.** Explain the characteristics of places and regions
- **7.2.9.A.** Explain the physical characteristics of places and regions, including spatial patterns of Earth's physical systems

Physical Processes

- **7.2.8.B** Explain the physical processes that shape patterns on Earth's surface
- **7.2.U.B.** Analyze the significance of physical processes in shaping the character of places and regions

Grades 11-12

Geography

Physical Characteristics of Places and Regions

Physical Characteristics

- **7.2.12.A.** Analyze the physical characteristics of places and regions, including the interrelationships among the components of Earth's physical systems.

Physical Processes

- **7.2.12.B.** Analyze the significance of physical processes in shaping the character of places and regions

Curriculum Framework Definitions:

Big Ideas: Declarative statements that describe concepts that transcend grade levels. Big Ideas are essential to provide focus

Essential Questions: Questions connected to the SAS framework and are specifically linked to the Big Ideas. They should frame student inquiry, promote critical thinking, and assist in learning transfer on specific content for all students.

Concepts: Describe what students should know (key knowledge) as a result of this instruction specific to grade level.

Competencies: Describe what students should be able to do (key skills) as a result of this instruction, specific to grade level.