

Environmental Science Institute

The University of Texas - Austin

GLOBAL WARMING: Impacts on Wildlife and Society

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This file contains suggestions for how to incorporate the material from this CD-ROM into curriculum using the Texas Essential Knowledge and Skills for Science.

Elementary

Kindergarten

(K.7) **Science concepts.** The student knows that many types of change occur. The student is expected to:

(B) identify that heat causes change, such as ice melting or the Sun warming the air and compare objects according to temperature; **[slide #4]**

(C) observe and record weather changes from day to day and over seasons; **[Observe day to day temperature differences and discuss the difference between changes in seasonal temperature and changes over a long period of time]**

(K.9) **Science concepts.** The student knows that living organisms have basic needs. The student is expected to:

(A) identify basic needs of living organisms; **[slide #19 & 32 - organisms need a certain environment]**

(C) identify ways that the Earth can provide resources for life. **[slide #32 - this butterfly relies upon a particular flower to survive]**

Science, Grade 1.

(1.7) **Science concepts.** The student knows that many types of change occur. The student is expected to:

(B) identify and test ways that heat may cause change such as when ice melts; **[slide #31 - Discuss why glaciers might melt after existing for thousands of years]**

(C) observe and record changes in weather from day to day and over seasons; **[Observe day to day temperature differences and discuss the difference]**

between changes in seasonal temperature and changes over a long period of time]

(1.9) **Science concepts.** The student knows that living organisms have basic needs. The student is expected to:

(B) compare and give examples of the ways living organisms depend on each other for their basic needs. [slide #32 - this butterfly relies upon a particular flower to survive]

Science, Grade 2.

(2.7) **Science concepts.** The student knows that many types of change occur. The student is expected to:

(D) observe, measure, and record changes in weather, the night sky, and seasons. [Observe day to day temperature differences and discuss the difference between changes in seasonal temperature and changes over a long period of time]

(2.9) **Science concepts.** The student knows that living organisms have basic needs. The student is expected to:

(B) compare and give examples of the ways living organisms depend on each other and on their environments. [slide #32 - this butterfly relies upon a particular flower to survive, slide #19 - Ask what is wrong with this picture and why.]

Science, Grade 3.

(3.8) **Science concepts.** The student knows that living organisms need food, water, light, air, a way to dispose of waste, and an environment in which to live. The student is expected to:

(A) observe and describe the habitats of organisms within an ecosystem; [slide #19 - Ask what is wrong with this picture and why. Describe the correct environment for the armadillo]

(C) describe environmental changes in which some organisms would thrive, become ill, or perish; [slide #19 - Ask what is wrong with this picture and why. slide #32 - this butterfly relies upon a particular flower to survive, what would happen to the butterfly if it got too warm for the flower to live?]

(3.11) **Science concepts.** The student knows that the natural world includes earth materials and objects in the sky. The student is expected to:

(D) describe the characteristics of the Sun. [slides #4 & 5]

Science, Grade 4.

(4.7) **Science concepts.** The student knows that matter has physical properties. The student is expected to:

(A) observe and record changes in the states of matter caused by the addition or reduction of heat; **[discuss how the atmosphere might become warmer with the addition of heat]**

(4.8) **Science concepts.** The student knows that adaptations may increase the survival of members of a species. The student is expected to:

(B) compare adaptive characteristics of various species; **[slides #19 & 20]**

(C) identify the kinds of species that lived in the past and compare them to existing species. **[slides #15 & 16]**

(4.11) **Science concepts.** The student knows that the natural world includes earth materials and objects in the sky. The student is expected to:

(C) identify the Sun as the major source of energy for the Earth and understand its role in the growth of plants, in the creation of winds, and in the water cycle. **[slides #4 & 5]**

Science, Grade 5.

(5.6) **Science concepts.** The student knows that some change occurs in cycles. The student is expected to:

(B) identify the significance of the water, carbon, and nitrogen cycles; **[slide #4 - Talk about the carbon cycle and discuss how it helps keep the Earth warm]**

(5.8) **Science concepts.** The student knows that energy occurs in many forms. The student is expected to:

(A) differentiate among forms of energy including light, heat, electrical, and solar energy; **[slides #4-5]**

(B) identify and demonstrate everyday examples of how light is reflected, such as from tinted windows, and refracted, such as in cameras, telescopes, and eyeglasses; **[slides #4-5, discuss how part of the sun's energy is reflected back into space]**

(5.9) **Science concepts.** The student knows that adaptations may increase the survival of members of a species. The student is expected to:

(A) compare the adaptive characteristics of species that improve their ability to survive and reproduce in an ecosystem; **[slides #19 & 20]**

(B) analyze and describe adaptive characteristics that result in an organism's unique niche in an ecosystem; **[slides #19 & 20]**

(C) predict some adaptive characteristics required for survival and reproduction by an organism in an ecosystem. **[slide #19 - What are the characteristics of a penguin that allow it to adapt to life on the ice?]**

(5.11) **Science concepts.** The student knows that certain past events affect present and future events. The student is expected to:

(B) draw conclusions about "what happened before" using data such as from tree-growth rings and sedimentary rock sequences; [slide #12 - much of this old temperature data is adapted from tree rings]

(C) identify past events that led to the formation of the Earth's renewable, non-renewable, and inexhaustible resources. [Discuss the carbon cycle and how using carbon based energy puts the stored carbon back into the carbon cycle]

Middle School

Science, Grade 6

(6.8) **Science concepts.** The student knows that complex interactions occur between matter and energy. The student is expected to:

(C) describe energy flow in living systems including food chains and food webs. [slides #4 & 5 - discuss how all of the food energy we eat originates from the sun]

(6.9) **Science concepts.** The student knows that obtaining, transforming, and distributing energy affects the environment. The student is expected to:

(C) research and describe energy types from their source to their use and determine if the type is renewable, non-renewable, or inexhaustible. [Discuss the carbon cycle and how using carbon based energy puts the stored carbon back into the carbon cycle]

(6.14) **Science concepts.** The student knows the structures and functions of Earth systems. The student is expected to:

(C) describe components of the atmosphere, including oxygen, nitrogen, and water vapor, and identify the role of atmospheric movement in weather change. [slide #3-5]

Science, Grade 7.

(7.8) **Science concepts.** The student knows that complex interactions occur between matter and energy. The student is expected to:

(B) identify that radiant energy from the Sun is transferred into chemical energy through the process of photosynthesis. [slides #3-5]

(7.12) **Science concepts.** The student knows that there is a relationship between organisms and the environment. The student is expected to:

(C) describe how different environments support different varieties of organisms; [slides #19-20]

(7.14) **Science concepts.** The student knows that natural events and human activity can alter Earth systems. The student is expected to:

(A) describe and predict the impact of different catastrophic events on the Earth; [slides #2,34 - discuss the idea that catastrophic weather events are increasing in frequency because of global warming]

(C) make inferences and draw conclusions about effects of human activity on Earth's renewable, non-renewable, and inexhaustible resources. [Entire lecture.]

Science, Grade 8.

(8.6) **Science concepts.** The student knows that interdependence occurs among living systems. The student is expected to:

(C) describe interactions within ecosystems. [slide #32 - This butterfly relies upon a particular plant for food.]

(8.11) **Science concepts.** The student knows that traits of species can change through generations and that the instructions for traits are contained in the genetic material of the organisms. The student is expected to:

(A) identify that change in environmental conditions can affect the survival of individuals and of species; [Entire lecture, slides #21-25: Discuss why this butterfly is going extinct in some areas]

(8.12) **Science concepts.** The student knows that cycles exist in Earth systems. The student is expected to:

(C) predict the results of modifying the Earth's nitrogen, water, and carbon cycles. [Entire lecture, slides #3-14, 21-35]

(8.14) **Science concepts.** The student knows that natural events and human activities can alter Earth systems. The student is expected to:

(C) describe how human activities have modified soil, water, and air quality. [slides #7, 14]

High School

Integrated Physics and Chemistry.

Science concepts. The student knows the impact of energy transformations in everyday life. The student is expected to:

(B) investigate and demonstrate the movement of heat through solids, liquids, and gases by convection, conduction, and radiation; [slides #3-6]

(C) analyze the efficiency of energy conversions that are responsible for the production of electricity such as from radiant, nuclear, and geothermal sources, fossil fuels such as coal, gas, oil, and the movement of water or wind; [slides #3-14, Discuss the relation between the carbon cycle and the greenhouse effect.]

(D) investigate and compare economic and environmental impacts of using various energy sources such as rechargeable or disposable batteries and solar cells; [Entire lecture]

Biology.

Science concepts. The student knows the theory of biological evolution. The student is expected to:

(B) illustrate the results of natural selection in speciation, diversity, phylogeny, adaptation, behavior, and extinction. [slide #19 - What mechanism allows penguins to survive in the Antarctic?]

(12) **Science concepts.** The student knows that interdependence and interactions occur within an ecosystem. The student is expected to:

(A) analyze the flow of energy through various cycles including the carbon, oxygen, nitrogen, and water cycles; [slides #3]

(C) compare variations, tolerances, and adaptations of plants and animals in different biomes; [slides #19-20]

(13) **Science concepts.** The student knows the significance of plants in the environment. The student is expected to:

(A) evaluate the significance of structural and physiological adaptations of plants to their environments; [slide #33 - Discuss why grasses may be more susceptible to increases in CO₂ than woody plants.]

Environmental Systems.

(4) **Science concepts.** The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to:

(B) make observations and compile data about fluctuations in abiotic cycles and evaluate the effects of abiotic factors on local ecosystems and biomes; [slide #7-13]

(E) predict changes that may occur in an ecosystem if biodiversity is increased or reduced. [slides #32 - Why is this butterfly affected if the plant it feeds on flowers earlier. How might that affect other parts of the ecosystem?]

(5) **Science concepts.** The student knows the interrelationships among the resources within the local environmental system. The student is expected to:

(C) document the use and conservation of both renewable and non-renewable resources; [Discuss the problems associated with non-renewable energy sources]

(D) identify renewable and non-renewable resources that must come from outside an ecosystem such as food, water, lumber, and energy; [Discuss carbon based energy sources and where the energy originally came from.]

(E) analyze and evaluate the economic significance and interdependence of components of the environmental system; [slide #27, What is the economic significance of a mosquito? What will happen if its range increases?]

(7) **Science concepts.** The student knows the relationship between carrying capacity and changes in populations and ecosystems. The student is expected to:

(B) calculate exponential growth of populations; [Discuss population increases in people and how that will affect our usage of energy.]

(C) evaluate the depletion of non-renewable resources and propose alternatives; [Entire lecture, discuss alternative energy sources]

(8) **Science concepts.** The student knows that environments change. The student is expected to:

(A) analyze and describe the effects on environments of events such as fires, hurricanes, deforestation, mining, population growth, and municipal development; [slide #9 - discuss the impacts of deforestation on the carbon cycle.]

(B) explain how regional changes in the environment may have a global effect; [slides #3-5,9: discuss the different impacts of deforestation and pollution on the carbon cycle.]

Astronomy.

(8) **Science concepts.** The student knows the role of the Sun in our solar system. The student is expected to:

(B) identify the source of energy within the Sun and explain that the Sun is the major source of energy for the Earth; [slides #3-5: Discuss the greenhouse effect.]

(C) describe the Sun's effects on the Earth. [slides #3-5: Discuss the greenhouse effect.]

(10) **Science concepts.** The student knows how life on Earth is affected by its unique placement and orientation in our solar system. The student is expected to:

(A) compare the factors essential to life on Earth such as temperature, water, mass, and gases to conditions on other planets; [slides #15, 19-20: Discuss the effect of temperature on life and adaptation]

(B) determine the effects of the Earth's rotation, revolution, and tilt on its environment; [How might subtle changes the earth's rotation affect temperature?]

Geology, Meteorology, and Oceanography.

(9) **Science concepts.** The student knows the role of natural energy resources. The student is expected to:

(A) research and describe the origin of fossil fuels such as coal, oil, and natural gas; [discuss the carbon cycle and the place of fossil fuels]

(B) analyze issues regarding the use of fossil fuels and other renewable, non-renewable, or alternative energy resources; [slides #3-14]

(C) analyze the significance and economic impact of the use of fossil fuels and alternative energy resources. [slides #27-35: What is the economic impact of increasing numbers of mosquitos or increasing frequency of hurricanes?]

(12) **Science concepts.** The student knows the characteristics of the atmosphere. The student is expected to:

(A) identify the atmosphere as a mixture of gases, water vapor, and particulate matter; [slides #3-4]

(B) analyze the range of atmospheric conditions that organisms will tolerate including types of gases, temperature, particulate matter, and moisture; [slides #19-20]

(C) determine the impact on the atmosphere of natural events and human activity. [slide #34]

(13) **Science concepts.** The student knows the role of energy in governing weather and climate. The student is expected to:

(A) describe the transfer of heat energy at the boundaries between the atmosphere, land masses, and oceans resulting in layers of different temperatures and densities in both the ocean and atmosphere; [slides #3-5]

(C) describe the effects of phenomena such as El Niño and the Jet Stream on local weather. **[Discuss the relative differences between the effects of a large climate phenomena such as El Niño and the greenhouse effect.]**