

SCIENCE – BIOLOGY I

Subject: Biology I
Academic Standard: B.1
Academic Standard Indicator: --
Core Standard: No

Standard Description (Academic or Indicator): Students work with the concepts, principles, and theories that enable them to understand the living environment. They recognize that living organisms are made of cells or cell products that consist of the same components as all other matter, involve the same kinds of transformation of energy, and move using the same kinds of basic forces. Students investigate, through laboratories and fieldwork, how living things function and how they interact with one another and their environment.

Suggestion for Integrating International Content: Have student pairs create local-global scientific activities with a partner. Team up with schools in other countries to learn about sustainable development together or use scientists from other countries as resources.
Suggested resources: <http://www.learn.org/>;
<http://globe.gov/>.

Subject: Biology I
Academic Standard: B.1
Academic Standard Indicator: B.1.25
Core Standard: No

Standard Description (Academic or Indicator): Explain that gene mutations in a cell can result in uncontrolled cell division, called cancer. Also know that exposure of cells to certain chemicals and radiation increases mutations and thus increases the chance of cancer.

Suggestion for Integrating International Content: Explain that a hole in the ozone allows more UV light to reach Australia than many other countries and that the increased radiation has increased mutations and led to a higher incidence of skin cancer. Then have students consider the campaigns to get individuals in Australia to decrease their exposure to UV light by using hats, sunscreen, and sun avoidance, and research how skin cancer rates have been impacted.

Subject: Biology I
Academic Standard: B.1
Academic Standard Indicator: B.1.27
Core Standard: Yes

Standard Description (Academic or Indicator): Explain that the similarity of human DNA sequences and the resulting similarity in cell chemistry and anatomy identify human beings as a unique species, different from all others. Likewise, understand that every other species has its own characteristic DNA sequence.

Suggestion for Integrating International Content: After explaining the connection between DNA and physical appearance, have students compare photographs of individuals from different parts of the world and contrast their own physical features with those of the individuals in the photographs. Next have students attempt to repeat the process with photographs of other animals, plants, fungi, protists, and bacteria. Guide students to an understanding that even with our multitude of differences, human beings are a unique species with our own characteristic DNA.

Subject: Biology I
Academic Standard: B.1
Academic Standard Indicator: B.1.29
Core Standard: Yes

Standard Description (Academic or Indicator): Understand that and explain how the actions of genes, patterns of inheritance, and the reproduction of cells and organisms account for the continuity of life, and give examples of how inherited characteristics can be observed at molecular and whole-organism levels - in structure, chemistry, or behavior.

Suggestion for Integrating International Content: Have students examine family photographs in books or online and identify physical characteristics that were passed from parents to children and grandchildren. Emphasize that although certain characteristics may be unique to that family or that part of the world, all families have common traits unique to the human species. **Suggested resources:** *Hungry Planet* by Peter Menzel and Faith D'Aluisio

(Material World, 2007);
<http://www.time.com/time/photogallery/0,29307,1626519,00.html>.

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Academic Standard Indicator: B.1.29
Core Standard: Yes

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Suggestion for Integrating International Content: Display and discuss a family tree for Queen Victoria and Prince Albert that shows the incidence of hemophilia in the British royal line.

Subject: Biology I
Academic Standard: B.1
Academic Standard Indicator: B.1.31
Core Standard: Yes

Standard Description (Academic or Indicator): Describe how natural selection provides the following mechanism for evolution: Some variation in heritable characteristics exists within every species, and some of these characteristics give individuals an advantage over others in surviving and reproducing. Understand that the advantaged offspring, in turn, are more likely than others to survive and reproduce. Also understand that the proportion of individuals in the population that have advantageous characteristics will increase.

Suggestion for Integrating International Content: Relate bird beak characteristics to available food sources in different species around the world. *Example:* The differentiation of finch bird beaks in the Galapagos Islands.

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Core Standard: Yes

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Suggestion for Integrating International Content: Study how changes in a society influence the ability of different organisms to survive. *Example:* Natural selection of peppered moths in England before, during, and after the Industrial Revolution.

Subject: Biology I
Academic Standard: B.1
Academic Standard Indicator: B.1.32
Core Standard: Yes

Standard Description (Academic or Indicator): Explain how natural selection leads to organisms that are well suited for survival in particular environments, and discuss how natural selection provides scientific explanation for the history of life on Earth as depicted in the fossil record and in the similarities evident within the diversity of existing organisms.

Suggestion for Integrating International Content: Using a map of Africa, have students pinpoint and date significant hominid fossil discovery sites and have students compare and contrast the skeletal structures of those fossils.

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Academic Standard Indicator: B.1.32
Core Standard: Yes

Standard Description (Academic or Indicator): Explain how natural selection leads to organisms that are well suited for survival in particular environments, and discuss how natural selection provides scientific explanation for the history of life on Earth as depicted in the fossil record and in the similarities evident within the diversity of existing organisms.

Suggestion for Integrating International

Content: The teacher provides an overview of fossil discoveries in Olduvai Gorge, Tanzania. Note that survival seemed to favor hominids that were able to craft and use increasingly complex tools as indicated by the fossil record.

Subject: Biology I

Academic Standard: B.1

Academic Standard Indicator: B.1.36

Core Standard: Yes

Standard Description (Academic or

Indicator): Trace the relationship between environmental changes and changes in the gene pool, such as genetic drift and isolation of sub-populations.

Suggestion for Integrating International

Content: Have students explore how environmental conditions at a geographic location can affect the frequency of certain alleles in a population, as demonstrated by connections between sickle cell anemia and the resistance to malaria. **Extension:** Have students explore the effects of climate changes on the incidence of sickle cell anemia and malaria.

Suggested resource:

http://www.pbs.org/wgbh/evolution/library/01/2/1_012_02.html.

Subject: Biology I

Academic Standard: B.1

Academic Standard Indicator: B.1.37

Core Standard: Yes

Standard Description (Academic or

Indicator): Explain that the amount of life any environment can support is limited by the available energy, water, oxygen, and minerals, and by the ability of ecosystems to recycle the residue of dead organic materials. Recognize, therefore, that human activities and technology can change the flow and reduce the fertility of the land.

Suggestion for Integrating International

Content: Have students use an online calculator to compare the environmental impact of individuals in different countries and their lifestyles. **Suggested resource:** Earth Day Network Footprint Calculator at <http://files.earthday.net/footprint/index.html>.

Subject: Biology I

Academic Standard: B.1

Academic Standard Indicator: B.1.38

Core Standard: Yes

Standard Description (Academic or

Indicator): Understand and explain the significance of the introduction of species, such as zebra mussels, into American waterways, and describe the consequent harm to native species and the environment in general.

Suggestion for Integrating International

Content: On a map, identify the origin of the zebra mussel from lakes in southeastern Russian and then identify other countries that now are home to the zebra mussel and view it as an invasive species. **Examples:** England; Italy; Spain; Sweden; U.S. Have students research and report on the effect of the mussels on native species and the environment in each of those locations.

Subject: Biology I

Academic Standard: B.1

Academic Standard Indicator: B.1.39

Core Standard: Yes

Standard Description (Academic or

Indicator): Describe how ecosystems can be reasonably stable over hundreds or thousands of years. Understand that if a disaster such as flood or fire occurs, the damaged ecosystem is likely to recover in stages that eventually result in a system similar to the original one.

Suggestion for Integrating International

Content: Have students research the impact of different natural disasters that have occurred in the world in the distant past and report on their effects on local ecosystems. Students should further identify how those ecosystems continued to change after the disaster. **Suggested resource:** http://en.wikipedia.org/wiki/List_of_natural_disasters.

Subject: Biology I

Academic Standard: B.1

Academic Standard Indicator: B.1.41

Core Standard: Yes

Standard Description (Academic or

Indicator): Recognize that and describe how

human beings are part of the Earth's ecosystems. Note that human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems.

Suggestion for Integrating International

Content: Have students consider specific examples of human-induced ecosystem changes around the world. *Examples:* Effect of dumping untreated sewage into water on the growth of algae in coastal waters in China; effect of deforestation on the native people in the Amazon Basin; effect of global warming on the coral in the Great Barrier Reef and polar bears of the Arctic; introduction of the Nile Perch into Lake Victoria for food and sport fishing.

Subject: Biology I

Academic Standard: B.1

Academic Standard Indicator: B.1.41

Core Standard: Yes

Standard Description (Academic or

Indicator): Recognize that and describe how human beings are part of the Earth's ecosystems. Note that human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems.

Suggestion for Integrating International

Content: Have students research and diagram the sequence of events that led to an outbreak of bubonic plague when the World Health Organization used DDT in Borneo for mosquito control in the 1950s. The action was an attempt to decrease the incidences of malaria.

Subject: Biology I

Academic Standard: B.1

Academic Standard Indicator: B.1.42

Core Standard: Yes

Standard Description (Academic or

Indicator): Realize and explain that at times, the environmental conditions are such that plants and marine organisms grow faster than decomposers can recycle them back to the environment. Understand that layers of energy-rich organic material thus laid down have been gradually turned into great coal beds and oil pools by the pressure of the overlying earth. Further understand that by burning these fossil fuels, people are passing most of the stored

energy back into the environment as heat and releasing large amounts of carbon dioxide.

Suggestion for Integrating International

Content: Have students use a graph of top carbon dioxide emitting countries to make a connection between developed and developing countries and their carbon dioxide emissions.

Suggested resource:

http://www.ucsusa.org/global_warming/science_and_impacts/science/graph-showing-each-countrys.html.

Subject: Biology I

Academic Standard: B.1

Academic Standard Indicator: B.1.43

Core Standard: Yes

Standard Description (Academic or

Indicator): Understand that and describe how organisms are influenced by a particular combination of living and non-living components of the environment.

Suggestion for Integrating International

Content: Have students research and diagram the sequence of events that led to an outbreak of bubonic plague when the World Health Organization used the pesticide DDT in Borneo for mosquito control in the 1950s. The action was an attempt to decrease the incidences of malaria.

Subject: Biology I

Academic Standard: B.1

Academic Standard Indicator: B.1.45

Core Standard: Yes

Standard Description (Academic or

Indicator): Recognize that and describe how the physical or chemical environment may influence the rate, extent, and nature of the way organisms develop within ecosystems.

Suggestion for Integrating International

Content: Have students research the known effects of uranium on development of human babies. Then have students relate their findings to specific data on birth defects that can be obtained from instances of use of weapons in Hiroshima, Japan during World War II and in Fallujah, Iraq in 2004. Help students determine

what further research, if any, might be necessary to establish a definite cause and effect.

Subject: Biology I

Academic Standard: B.2

Academic Standard Indicator: B.2.4

Core Standard: Yes

Standard Description (Academic or Indicator): Explain that after the publication of *Origin of Species*, biological evolution was supported by the rediscovery of the genetics experiments of an Austrian monk, Gregor Mendel, by the identification of genes and how they are sorted in reproduction, and by the discovery that the genetic code found in DNA is the same for almost all organisms.

Suggestion for Integrating International Content: Emphasize the global nature of science by stressing that the travels of an Englishman (Darwin) around the world led to hypotheses supported by the earlier work of an Austrian monk working in a monastery in the Czech Republic.
