Mississippi Science

Environmental Science

Biosphere and Biodiversity ENV.1

Conceptual Understanding: The biosphere is a system of biomes, each with unique characteristics. These characteristics are classified as biotic or abiotic. The environment in which humans live is dependent on a system of cycles. These biogeochemical cycles are the water, nitrogen, carbon, and phosphorus cycles. The flow of energy within the environment is critical for the success of life. Biodiversity within a biome is fragile and easily affected by human actions. Plant and animal populations are dynamic and are demonstrated through graphical analysis.

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A Students will investigate the interdependence of diverse living organisms and their interactions with the components of the biosphere. ENV.1A

1 Identify, investigate, and evaluate the interactions of the abiotic and biotic factors that determine the types of organisms that live in major biomes. ENV.1A.1

2 Evaluate evidence in nonfiction text to explain how biological or physical changes within biomes affect populations and communities and how changing conditions may result in altered ecosystems. ENV.1A.2

3 Use models to explain why the flow of energy through an ecosystem can be illustrated by a pyramid with less energy available at the higher trophic levels compared to lower levels. ENV.1A.3

4 Describe symbiotic relationships (e.g., mutualism, parasitism, and commensalism) and other co-evolutionary (e.g., predator-prey, cooperation, competition, and mimicry) relationships within specific environments. ENV.1A.4

5 Develop and use models to diagram the flow of nitrogen, carbon, and phosphorus through the environment. ENV.1A.5

6 Use mathematics, graphics, and informational text to determine how population density-dependent and density-independent limiting factors affect populations and diversity within ecosystems. Use technology to illustrate and compare a variety of population-growth curves. ENV.1A.6

7 Analyze and interpret quantitative data to construct explanations of how the carrying capacity of an ecosystem may change as the availability of resources changes. ENV.1A.7

8 Utilize data to communicate changes within a given population and the environmental factors that may have impacted these changes (e.g., weather patterns, natural disasters) ENV.1A.8

9 Evaluate and communicate data that explains how human activity may impact biodiversity (e.g., introduction, removal, and reintroduction of an organism within an ecosystem; land usage) and genetic variations of organisms, including endangered and threatened species. ENV.1A.9

10 Enrichment: Engage in scientific argument from evidence the benefits versus harm of genetically modified organisms. ENV.1A.10

Natural Resources Use and Conservation ENV.2

Conceptual Understanding: The environment is affected by human demand for its resources. However, through conservation applications, a balance may be reached between human sustainability and the environment.

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A Students will relate the impact of human activities on the environment, conservation activities, and efforts to maintain and restore ecosystems. ENV.2A

1 Differentiate between renewable and nonrenewable resources and compare and contrast the pros and cons of using these resources. ENV.2A.1

2 Investigate and research the pros and cons of using traditional sources of energy (e.g., fossil fuels) and alternative sources of energy (e.g., water, wind, geothermal, biomass/biofuels, solar). ENV.2A.2

3 Compare and contrast biodegradable and nonbiodegradable wastes and their significance in landfills. ENV.2A.3

4 Examine solutions for developing, conserving, managing, recycling, and reusing energy and mineral resources to minimize impacts in natural systems (e.g., agricultural soil use, mining for coal, construction sites, and exploration of petroleum and natural gas sources). ENV.2A.4

5 Research various resources related to water quality and pollution (e.g., nonfictional text, EPA's Surf Your Watershed, MDEQ publications) and communicate the possible effects on the environment and human health. ENV.2A.5

6 Enrichment: Obtain water from a local source (e.g., stream on campus, rainwater, ditch water) to monitor water quality over time, using a spreadsheet program to graphically represent collected data. ENV.2A.6

Human Activities and Climate Change ENV.3

Conceptual Understanding: Humans are a part of their environment and may have a detrimental impact on the environment. Using evidence based on scientific research, efforts are underway to repair the environment. Historical and current regional and global models illustrate the changes in the environment.

A Students will discuss the direct and indirect impacts of certain types of human activities on the Earth's climate. ENV.3A

1 Use a model to describe cycling of carbon through the ocean, atmosphere, soil, and biosphere and how increases in carbon dioxide concentrations have resulted in atmospheric and climate changes. ENV.3A.1

2 Interpret data and climate models to predict how global and regional climate change can affect Earth's systems (e.g., precipitation, temperature, impacts on sea level, global ice volumes, and atmosphere and ocean composition). ENV.3A.2

3 Use satellite imagery and other resources to analyze changes in biomes over time (e.g., glacial retreat, deforestation, desertification) and propose strategies to reduce the impact of human activities leading to these issues. ENV.3A.3

4 Enrichment: Determine mathematically an individual's impact on the environment (carbon footprint, water usage, landfill contribution) and develop a plan to reduce personal contribution. ENV.3A.4

Human Su

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Conceptual Understanding: Human health is dependent on the environment. hanges within an environment, whether natural or human-caused, may lead to e spread of disease. Sudden environmental changes (e.g., tsunami or volcanic activity) lead to human migration into other areas of the environment. Case

studies illustrate the need to intervene in environmental change, when possible, to improve health issues (e.g., smog's effect on asthma patients).

A Students will demonstrate an understanding of the interdependence of human sustainability and the environment. ENV.4A

1 Identify human impact and develop a solution for protection of the atmosphere, considering pollutants (e.g., acid rain, air pollution, smog, ozone layer, or increased levels of greenhouse gases) and the impacts of pollutants on human health (e.g., asthma, COPD, emphysema, and cancer). ENV.4A.1

2 Evaluate data and other information to explain how key natural resources (e.g., water sources, fertile soils, concentrations of minerals, and fossil fuels), natural hazards, and climate changes influence human activity (e.g., mass migrations, human health). ENV.4A.2

3 Enrichment: Research and analyze case studies to determine the impact of human-related and natural environmental changes on human health and communicate possible solutions to reduce/resolve the dilemma. ENV.4A.3

4 Enrichment: Explore online resources related to air pollution to determine air quality in a geographic area and communicate the possible effects on the environment and human health. ENV.4A.4

5 Enrichment: Use an engineering design process to define a problem, design, construct, evaluate, and improve a device or method to reduce or prevent human impact on a natural resource (e.g., build a water filter, design an air purifier, develop a method to prevent parking lot pollution from entering a watershed).* ENV.4A.5