Science Learning Targets

Environmental Science

Unit 1 – Ecology

SEV1. Obtain, evaluate, and communicate information to investigate the flow of energy and cycling of matter within an ecosystem.

a. **Develop and use a model to compare and analyze the levels of biological organization including organisms, populations, communities, ecosystems, and biosphere. (Product)**
   - I can accurately define and explain what the following terms are: Organisms, Population, Communities, Ecosystem, Biomes, Biosphere. (Knowledge)
   - I can compare and analyze the levels of biological organization from organisms to the Biosphere. (Reasoning)
   - I can develop and use a model to compare the levels of biological organization that is supported by data from my analysis of each of the levels. (Product)

b. **Develop and use a model based on the Laws of Thermodynamics to predict energy transfers throughout an ecosystem (food chains, food webs, and trophic levels). (Product)**
   - I can explain how the Laws of Thermodynamics apply to the process of energy transfer throughout an ecosystem. (Knowledge)
   - I can identify and explain models that represent energy transfer in an ecosystem. Models include food chains, food webs, and trophic levels. (Knowledge)
   - I can describe organisms in an ecosystem based on their feeding relationships. (Knowledge)
   - I can relate the Laws of Thermodynamics to models that represent energy transfer in an ecosystem. (Reasoning)
   - I can use the Laws of Thermodynamics to predict energy transfers in a given ecosystem. (Reasoning)
   - I can develop and use a model based on the Laws of Thermodynamics to predict energy transfers throughout a given ecosystem. (Product)

c. **Analyze and interpret data to construct an argument of the necessity of biogeochemical cycles (hydrologic, nitrogen, phosphorus, oxygen, and carbon) to support a sustainable ecosystem. (Product)**
   - I can describe how the biogeochemical cycles interact in a sustainable ecosystem. (Knowledge)
   - I can identify the biogeochemical cycles in an ecosystem. Cycles include hydrologic, nitrogen, phosphorus, oxygen, and carbon. (Knowledge)
   - I can identify data models that demonstrate the interdependence of the biogeochemical cycles in an ecosystem. (Knowledge)
   - I can develop a claim supported by evidence about the necessity of biogeochemical cycles to support a sustainable ecosystem. (Reasoning)
   - I can analyze and interpret data to construct an argument of the necessity of biogeochemical cycles to support a sustainable ecosystem. (Product)

Unit 2 – Biological Diversity

SEV1. Obtain, evaluate, and communicate information to investigate the flow of energy and cycling of matter within an ecosystem.

d. Evaluate claims, evidence, and reasoning of the relationship between the physical factors (e.g., insolation, proximity to coastline, topography) and organismal adaptations within terrestrial biomes. (Reasoning)

- I can identify terrestrial biomes. (Knowledge)
- I can describe organismal adaptations characteristic of organisms that live in terrestrial biomes. (Knowledge)
- I can describe the physical factors (insolation, proximity to coastline, and topography) of terrestrial biomes. (Knowledge)
- I can explain the relationship between the physical factors of a terrestrial biome and organismal adaptations. (Knowledge)
- I can develop a claim supported by evidence of the relationship between the physical factors of terrestrial biomes and organismal adaptations. (Reasoning)
- I can evaluate multiple claims supported by evidence of the relationship between the physical factors of terrestrial biomes and organismal adaptations. (Reasoning)

e. Plan and carry out an investigation of how chemical and physical properties impact aquatic biomes in Georgia. (Skill)

- I can identify aquatic biomes in Georgia. (Knowledge)
- I can describe the chemical and physical properties of aquatic biomes in Georgia. (Knowledge)
- I can ask questions about how chemical and physical properties impact aquatic biomes in Georgia. (Reasoning)
- I can plan and carry out an investigation to answer questions about the impact of chemical and physical properties on aquatic biomes in Georgia. (Skill)

SEV2. Obtain, evaluate, and communicate information to construct explanations of stability and change in Earth's ecosystems.

c. Construct an argument to predict changes in biomass, biodiversity, and complexity within ecosystems, in terms of ecological succession. (Product)

- I can describe the process of ecological succession. (Knowledge)
- I can describe an ecosystem in terms of biomass, biodiversity, and complexity. (Knowledge)
- I can describe ecological succession in terms of biomass, biodiversity, and complexity. (Knowledge)
- I can relate the biomass, biodiversity, and complexity of an ecosystem to its progression in ecological succession. (Reasoning)
- I can examine the biomass, biodiversity, and complexity of an ecosystem to describe the stage of ecological succession it is in. (Reasoning)
- I can construct an argument to predict changes in biomass, biodiversity, and complexity within ecosystems in terms of ecological succession. (Product)

Unit 2 (cont.) – Biological Diversity

d. Construct an argument to support a claim about the value of biodiversity in ecosystem resilience including keystone, invasive, native, endemic, indicator, and endangered species. (Product)

- I can use data to describe the biodiversity of an ecosystem. (Knowledge)
- I can describe an ecosystem in terms of its ability to resist change and/or recover from a disturbance. (Knowledge)
- I can describe how keystone, invasive, native, endemic, indicator, and endangered species interact in an ecosystem. (Knowledge)
- I can explain ecosystem resilience in terms of keystone, invasive, native, endemic, indicator, and endangered species. (Knowledge)
- I can explain the relationship between biodiversity and ecosystem resilience. (Knowledge)
- I can predict how a change in the biodiversity of an ecosystem will affect ecosystem resilience. (Reasoning)
- I can develop a claim about the value of biodiversity in ecosystem resilience and include keystone, invasive, native, endemic, indicator, and endangered species. (Reasoning)
- I can gather evidence to support a claim about the value of biodiversity in ecosystem resilience. (Reasoning)
- I can construct an argument to support a claim about the value of biodiversity in ecosystem resilience including keystone, invasive, native, endemic indicator, and endangered species. (Product)

Unit 3 – Biogeochemical Cycles

SEV2. Obtain, evaluate, and communicate information to construct explanations of stability and change in Earth's ecosystems.

a. **Analyze and interpret data related to short-term and long-term natural cyclic fluctuations associated with climate change. (Reasoning)**

- I can identify factors of climate change in ecosystems. (Knowledge)
- I can describe short-term natural cyclic changes in an ecosystem. (Knowledge)
- I can describe long-term natural cyclic changes in an ecosystem. (knowledge)
- I can identify data models that demonstrate short-term and long-term natural cyclic fluctuations in ecosystems. (Knowledgeable)
- I can identify data models that demonstration climate change in ecosystems. (Knowledge)
- I can use data models to determine the relationship between short-term and long-term natural cyclic fluctuations and climate change. (Reasoning)
- I can analyze and interpret data related to short-term and long-term natural cyclic fluctuations associated with climate change. (Reasoning)

b. **Analyze and interpret data to determine how changes in atmospheric chemistry (carbon dioxide and methane) impact the greenhouse effect. (Reasoning)**

- I can describe the greenhouse effect. (Knowledge)
- I can identify factors that cause changes in atmospheric carbon dioxide and chemistry. (Knowledge)
- I can identify data models that represent changes in atmospheric chemistry (carbon dioxide and methane). (Knowledge)
- I can identify data models that represent the greenhouse effect. (Knowledge)
- I can analyze and interpret data to determine the relationship between changes in atmospheric chemistry and the greenhouse effect. (Reasoning)

Unit 4 – Energy Resources

SEV3. Obtain, evaluate, and communicate information to evaluate types, availability, allocation, and sustainability of energy resources.

a. **Analyze and interpret data to communicate information on the origin and consumption of renewable forms of energy (wind, solar, geothermal, biofuel, and tidal) and non-renewable energy sources (fossil fuels and nuclear energy). (Reasoning)**

- I can identify the sources of renewable and nonrenewable forms of energy. (Knowledge)
- I can differentiate between the origins of renewable and nonrenewable forms of energy. (Knowledge)
- I can use data to relate the rate of consumption to the origins of renewable forms of energy. (Reasoning)
- I can use data to relate the rate of consumption to the origins of nonrenewable forms of energy. (Reasoning)
- I can analyze and interpret data to explain the origin and consumption of renewable and nonrenewable forms of energy sources. (Reasoning)

b. **Construct an argument based on data about the risks and benefits of renewable and nonrenewable energy sources. (Product)**

- I can explain the risks of the use of renewable and nonrenewable energy sources. (Knowledge)
- I can explain the benefits of the use of renewable and nonrenewable energy sources. (Knowledge)
- I can identify data models that represent the risks and benefits of renewable and nonrenewable energy sources. (Knowledge)
- I can develop a claim about the risks and benefits of renewable and nonrenewable energy sources. (Reasoning)
- I can gather data to support a claim about the risks and benefits of renewable and nonrenewable energy sources (Reasoning)
- I can construct an argument based on data about the risks and benefits of renewable and nonrenewable energy sources. (Product)

c. **Obtain, evaluate, and communicate data to predict the sustainability potential of renewable and nonrenewable energy resources. (Reasoning)**

- I can identify data models represent the effect of renewable and nonrenewable energy sources on the environment. (Knowledge)
- I can explain the sustainability potential of renewable and nonrenewable energy resources. (Knowledge)
- I can gather data and identify trends associated with the use of renewable and nonrenewable energy sources. (Reasoning)
- I can obtain and evaluate data trends related to renewable and nonrenewable energy sources in order make predictions about the sustainability potential of these energy sources. (Reasoning)

Unit 4 (cont.) – Energy Resources

d. Design and defend a sustainable energy plan based on scientific principles for your location. (Product)

- I can identify the energy demands for my location. (Knowledge)
- I can identify scientific principles related to energy. (Knowledge)
- I can review energy plans and relate them to scientific principles. (Reasoning)
- I can evaluate energy plans to determine the strengths and weaknesses as it relates to sustainability. (Reasoning)
- I can design and defend a sustainable energy plan based on scientific principles for my location. (Product)

SEV4. Obtain, evaluate, and communicate information to analyze human impact on natural resources.

b. Design, evaluate, and refine solutions to reduce human impact on the environment including, but not limited to, smog, ozone depletion, urbanization, and ocean acidification. (Product)

- I can identify ways humans impact the environment. (Knowledge)
- I can conduct research to explain how factors like smog ozone depletion, urbanization, and ocean acidification have impacted in the environment. (Knowledge)
- I can evaluate solutions developed to reduce human impact on the environment including but not limited to, smog, ozone depletion, urbanization, and ocean acidification to determine strengths and weaknesses. (Reasoning)
- I can design and, based on feedback, refine solutions to reduce human impact on the environment including, but not limited to, smog, ozone depletion, urbanization, and ocean acidification. (Product)

c. Construct an argument to evaluate how human population growth affects food demand and food supply (GMOs, monocultures, desertification, Green Revolution). (Product)

- I can explain patterns in human population growth over. (Knowledge)
- I can describe practices used to supply food to the meet the demand of the human population (GMOs, monocultures, desertification, Green Revolution). (Knowledge)
- I can explain patterns in food supply and food demand over time. (Knowledge)
- I can explain the relationship between human population growth and demand for food. (Reasoning)
- I can explain the correlation between human population growth and the practices used to supply food to the human population. (Reasoning)
- I can develop claim to predict the effect human population growth will have on food demand and food supply. (Reasoning)
- I gather evidence to support a claim to predict effect human population growth will have on food demand and food supply. (Reasoning)
- I can construct an argument to evaluate how human population growth affects food demand and food supply. (Product)

Unit 5 – Human Population Impacts

SEV4. Obtain, evaluate, and communicate information to analyze human impact on natural resources.

a. **Construct and revise a claim based on evidence on the effects of human activities on natural resources. (Reasoning)**

- I can identify natural resources used by humans. (Knowledge)
- I can describe ways humans use Earth's natural resources. (Knowledge)
- I can explain how human activities impact Earth's natural resources. (Knowledge)
- I can develop a claim supported by evidence to explain the effect of human activities on Earth's natural resources. (Reasoning)
- I can use feedback to revise a claim supported by evidence to explain the effect of human activities on Earth's natural resources. (Reasoning)

SEV5. Obtain, evaluate, and communicate information about the effects of human population growth on global ecosystems.

a. **Construct explanations about the relationship between the quality of life and human impact on the environment in terms of population growth, education, and gross national product. (Reasoning)**

- I can describe human impact on the environment in terms of population growth, education, and gross national product. (Knowledge)
- I can identify ways human quality of life is measured nationally. (Knowledge)
- I can describe the national human quality of life. (Knowledge)
- I can use data models to identify patterns in the national human quality of life over time. (Knowledge)
- I can use data models to determine factors that affect the national human quality of life over time. (Reasoning)
- I can describe the relationship between national human quality of life and human impact on the environment. (Reasoning)
- I can construct an explanation of how national human quality of life is related to human impact on the environment in terms of population growth, education, and gross national product. (Reasoning)

Unit 5 (cont.) – Human Population Impacts

b. Analyze and interpret data on global patterns of population growth (fertility and mortality rates) and demographic transitions in developing and developed countries. (Reasoning)

- I can identify data models that represent global population growth (fertility and mortality rates). (Knowledge)
- I can identify data models that represent demographic information in developing and developed countries. (Knowledge)
- I can use data models to identify patterns in population growth (fertility and mortality rates). (Knowledge)
- I can use data models to identify patterns in demographic transitions in developing and developed countries. (Knowledge)
- I can analyze and interpret data models to makes predictions about global population growth (fertility and mortality rates) and demographic transitions in developing and developed countries based on trends and patterns. (Reasoning)

c. Construct an argument from evidence regarding the ecological effects of human innovations (Agricultural, Industrial, Medical, and Technological Revolutions) on global ecosystems. (Product)

- I can describe global ecosystems. (Knowledge)
- I can describe human innovations including the agricultural, industrial, medical, and technological revolutions. (Knowledge)
- I can gather evidence to demonstrate the effects of human innovations on global ecosystems. (Reasoning)
- I can use evidence to develop a claim about the effects of human innovation on global ecosystems. (Reasoning)
- I can construct an argument regarding the ecological effects of human innovations on global ecosystems. (Product)

d. Design and defend a sustainability plan to reduce your individual contribution to environmental impacts, taking into account how market forces and societal demands (including political, legal, social, and economic) influence personal choices. (Product)

- I can identify my individual contribution to environmental impacts. (Knowledge)
- I can identify market forces and societal demands that influence my personal choices. (Knowledge)
- I can explain how market forces influence my personal choices. (Reasoning)
- I can determine how my personal choices, influenced by market forces, impact the environment. (Reasoning)
- I can determine ways to reduce my individual contribution to environmental impacts by examining my personal choices that are influenced by market forces. (Reasoning)
- I can design and defend a sustainability plan to reduce your individual contribution to environmental impacts, taking into account how market forces and societal demands (including political, legal, social, and economic) influence personal choices. (Product)