Environmental Science, Semester B

Course Overview and Goals

Environmental Science explores the biological, physical, and sociological principles related to the environment in which organisms live on Earth: the biosphere. Course topics include natural systems on Earth, biogeochemical cycles, the nature of matter and energy, the flow of matter and energy through living systems, populations, communities, ecosystems, ecological pyramids, renewable and nonrenewable natural resources, land use, biodiversity, pollution, conservation, sustainability, and human impacts on the environment.

The course provides students with opportunities to learn and practice scientific skills within the context of relevant scientific questions. Scientific inquiry skills are embedded in the direct instruction, wherein students learn to ask scientific questions, deconstruct claims, form and test hypotheses, and use logic and evidence to draw conclusions about the concepts. Case studies of current environmental challenges introduce each content lesson and acquaint students with real-life environmental issues, debates, and solutions. Lab activities reinforce critical thinking, writing, and communication skills and help students develop a deeper understanding of the nature of science. Virtual labs enable students to engage in investigations that would otherwise require long periods of observation at remote locations and to explore simulations that enable environmental scientists to test predictions. Throughout this course, students are given an opportunity to understand how biology, earth science, and physical science are applied to the study of the environment and how technology and engineering are contributing solutions for studying and creating a sustainable biosphere.

This course is built to state standards.

By the end of this course, you will be able to do the following:

- Evaluate how the environment reacts to both human exploitation and sustainability measures.
- Classify various forms of environmental damage, connecting each to the economic forces responsible, including urbanization and energy use.
- Differentiate environmental issues by scale, from the impact of individuals to the effects of sweeping international policies.

Lab materials needed for this course

Course Components and Grading Rubric

The table gives a breakdown of the weight for each component in the course. Weight represents the percentage of the total score coming from each activity.

Course Components	Count	Weight
Pretest. *A pretest is an optional assessment, typically designed for credit recovery. If a student shows mastery of a lesson objective, the student may be automatically exempted from the upcoming activities associated with the mastered objective. Each passing pretest grade is entered into the gradebook.*	4	0%
Practice. *A practice activity provides instruction similar to that found in a study so that students can practice or review skills necessary to complete their assignment with mastery.*	7	5%
Discussion. *A discussion activity is an opportunity for students to collaborate with their peers. This activity gives students the opportunity to practice speaking and listening in a clear and logical manner and to receive feedback from peers.*	4	5%
Explore. *An explore activity gives students the opportunity to conduct research, evaluate source materials, and synthesize information.*	4	5%
Project. *A project is a hands-on investigation that extends over several weeks.*	2	5%
Lab. *A lab is a hands-on investigatory activity that can be completed in a couple of class periods. It can include virtual labs, modeling exercises, and engineering design activities.*	4	10%
Mastery Test. *A mastery test is a computer-scored lesson-level summative assessment.*	30	30%
Posttest. *A posttest appears at the end of each unit.*	4	15%
End-Of-Semester Test. *An end-of-semester test (EOS) appears at the end of each course.*	1	5%
Teacher-Graded Posttest. *A posttest that prompts students for written responses appears at the end of each unit.*	4	15%
Teacher-Graded End-Of-Semester Test. *An end-of-semester test (EOS) that prompts students for written responses appears at the end of each course.*	1	5%

Course Components	Count	Weight
Total	**65**	**100%**

**Teachers may manually adjust these weights if desired, per district grading requirements.*

UNIT 1: HUMANS AND THE ENVIRONMENT

In this unit, you will analyze the ways humans exploit both land and water, then determine the consequences.

Lesson and Duration	Activities	Objectives
Human Societies *5 hours, 20 minutes*	*Overview: Human Societies* *Study: Human Populations* *Mastery Test: Human Populations* *Study: Human Communities* *Mastery Test: Human Communities* *Checkup: Human Societies* *Explore: Public Health Policies*	• Identify historical trends in human population growth and distribution. • Identify characteristics of human populations. • Examine the purposes of human communities. • Identify different kinds of human communities. • Recognize how individuals work together in groups. • Recognize how individuals and groups work together in communities. • Research objectives and accomplishments of public health policies.
Earth's Natural Resources *5 hours, 50 minutes*	*Overview: Earth's Natural Resources* *Study: Land and Water Resources* *Mastery Test: Land and Water Resources* *Study: Mineral and Energy Resources*	• Identify natural resources obtained from Earth's land and water and used to support the lifestyles of humans. • Evaluate the interdependence and economic significance of natural resources.

Lesson and Duration	Activities	Objectives
	Mastery Test: Mineral and Energy Resources *Study: Biological Resources* *Mastery Test: Biological Resources* *Practice: Earth's Natural Resources*	• Analyze quantitative data to explain how urbanization can affect biodiversity and populations in ecosystems.
Land Use and Its Effects *5 hours, 50 minutes*	*Overview: Land Use and Its Effects* *Study: Agriculture, Forestry, and Fishing* *Mastery Test: Agriculture, Forestry, and Fishing* *Study: Mining and Drilling* *Mastery Test: Mining and Drilling* *Study: Recreation, Conservation, and Urban Development* *Mastery Test: Recreation, Conservation, and Urban Development* *Practice: Land Use and Its Effects*	• Summarize the effects and cost-benefit trade-offs of practices used in commercial agriculture, forestry, and fishing. • Evaluate the hazards and risks involved in obtaining and managing natural resources. • Analyze quantitative data to explain how deforestation can affect biodiversity and populations in ecosystems. • Summarize the advantages and disadvantages of using different energy resources. • Summarize the effects of human activities such as recreation, urbanization, conservation, preservation, restoration, and resource gathering and management on natural ecosystems.
Doing Science: Humans and the Environment *3 hours*	*Overview: Doing Science: Humans and the Environment* *Study: Investigate Resource Consumption* *Mastery Test: Investigate Resource Consumption* *Lab: Investigate Resource Consumption*	• Formulate a hypothesis, and design a controlled experiment to test it. • Recognize common laboratory tools and techniques used to conduct the experiment you designed. • Conduct a scientific investigation, using a scientific process and demonstrating the proper and safe use of laboratory equipment.

Lesson and Duration	Activities	Objectives
	Discussion: Investigate Resource Consumption	• Analyze data by using data tables, by calculating the range and average of a set of measurements, and by identifying sources of error. • Evaluate lab procedures and results in a discussion with your peers.
Wrap-Up: Humans and the Environment *2 hours*	*Review: Humans and the Environment* *Posttest: Humans and the Environment* *Teacher-Graded Posttest: Humans and the Environment*	• Review key ideas presented in the unit. • Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment. • Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

UNIT 2: ENVIRONMENTAL CHALLENGES

In this unit, you will differentiate among various forms of pollution and waste, evaluating their local impacts and their relationship to climate change.

Lesson and Duration	Activities	Objectives
Resource Availability *8 hours, 50 minutes*	*Overview: Resource Availability* *Study: Renewable Resources* *Mastery Test: Renewable Resources* *Study: Nonrenewable Resources* *Mastery Test: Nonrenewable Resources* *Study: Alternative Energy Resources* *Mastery Test: Alternative Energy Resources*	• Identify resources on which humans depend. • Differentiate between renewable and nonrenewable resources. • Evaluate the cost-benefit trade-offs of using renewable resources instead of nonrenewable resources. • Determine how the use of natural resources will affect future generations of humans.

Lesson and Duration	Activities	Objectives
	Practice: Resource Availability *Project: Explore Your Local Environmental Challenges*	• Examine alternative forms of energy production. • Research and describe environmental challenges that impact the geographical area in which you live. • Evaluate solutions to a nation's energy crisis using a computer simulation based on prioritized criteria and trade-offs that account for constraints such as cost, safety, and reliability, as well as possible social, cultural, and environmental impacts.
Pollution and Waste Management *4 hours, 5 minutes*	*Overview: Pollution and Waste Management* *Study: Water, Air, and Land Pollution* *Mastery Test: Water, Air, and Land Pollution* *Study: Waste Management* *Mastery Test: Waste Management* *Practice: Pollution and Waste Management*	• Identify point source and nonpoint source causes of air, land, and water pollution. • Determine the effects of pollution on oceans, freshwater supplies, air, and land. • Identify the consequences of air, land, and water pollution on human health and societies. • Evaluate the hazards pollutants pose to wildlife and other types of natural resources. • Differentiate among methods of waste management, including burial in a landfill, dumping, incineration, composting, recycling, and reuse. • Evaluate the impact of waste management and reduction strategies on resource availability.
Environmental Change	*Overview: Environmental Change* *Study: Climate Change*	• Determine the effects of air pollution on the natural systems that regulate Earth's climate.

Lesson and Duration	Activities	Objectives
5 hours, 20 minutes	*Mastery Test: Climate Change* *Study: Effects of Climate Change* *Mastery Test: Effects of Climate Change* *Checkup: Environmental Change* *Explore: Effects of Climate Change*	• Analyze the historical trends observed in global climate data. • Relate human activities to observed changes in global climate. • Analyze how variations in the flow of energy into and out of Earth's systems result in changes in climate, using models. • Evaluate differing views on global warming and climate change. • Summarize scientists' predictions about the effects of global climate change on the biosphere. • Analyze geoscience data, global climate models, and computer simulations to identify climate change trends and predict future impacts to Earth systems.
Doing Science: Environmental Challenges *3 hours*	*Overview: Doing Science: Environmental Challenges* *Study: Investigate How Pollutants Affect Plants* *Mastery Test: Investigate How Pollutants Affect Plants* *Lab: Investigate How Pollutants Affect Plants* *Discussion: Investigate How Pollutants Affect Plants*	• Formulate a hypothesis, and design a controlled experiment to test it. • Recognize common laboratory tools and techniques used to conduct the experiment you designed. • Conduct a scientific investigation, using a scientific process and demonstrating the proper and safe use of laboratory equipment. • Analyze data by using data tables, by calculating the range and average of a set of measurements, and by identifying sources of error. • Evaluate lab procedures and results in a discussion with your peers.

Lesson and Duration	Activities	Objectives
Wrap-Up: Environmental Challenges *2 hours*	*Review: Environmental Challenges* *Posttest: Environmental Challenges* *Teacher-Graded Posttest: Environmental Challenges*	• Review key ideas presented in the unit. • Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment. • Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

UNIT 3: POLITICS AND THE ENVIRONMENT

In this unit, you will research and evaluate a range of environmental issues that affect the nation and the globe, such as climate change and shrinking biodiversity.

Lesson and Duration	Activities	Objectives
The Concept of the Commons *4 hours, 5 minutes*	*Overview: The Concept of the Commons* *Study: The Tragedy of the Commons* *Mastery Test: The Tragedy of the Commons* *Study: Managing the Commons* *Mastery Test: Managing the Commons* *Practice: The Concept of the Commons*	• Recognize the definition and examples of a "common." • Determine how the overuse and degradation of natural resources affects the biosphere and human societies. • Analyze how conservation and preservation of natural resources affects their availability and quality. • Relate conservation and preservation of natural resources to the sustainability of ecosystems and human societies.
National Environmental Policies *5 hours, 20 minutes*	*Overview: National Environmental Policies* *Study: Protecting Water, Air, and Land* *Mastery Test: Protecting Water, Air, and Land*	• Summarize the history, provisions, and effects of the National Park Service Organic Act, Clean Air Act, Clean Water Act, Soil and Water Resources Conservation Act, and Endangered Species Act.

Lesson and Duration	Activities	Objectives
	Study: Protecting Endangered Species *Mastery Test: Protecting Endangered Species* *Checkup: National Environmental Policies* *Explore: Species Survival Plans*	• Evaluate challenges that face the national parks.
Global Environmental Policies *4 hours, 5 minutes*	*Overview: Global Environmental Policies* *Study: Protecting Environmental Quality* *Mastery Test: Protecting Environmental Quality* *Study: Protecting Wildlife and Biodiversity* *Mastery Test: Protecting Wildlife and Biodiversity* *Practice: Global Environmental Policies*	• Summarize the goals and provisions of international treaties and protocols that address the effects of human activities on the environment, including the Antarctic Treaty System, Montreal Protocol, and Kyoto Protocol. • Summarize the goals and provisions of international treaties and protocols that address biodiversity, such as the United Nations' Convention of International Trade in Endangered Species (CITES), the RAMSAR Convention on Wetlands, the International Treaty on Plant Genetic Resources for Food and Agriculture, and the Convention on Biological Diversity. • Evaluate the effects of international treaties and protocols on environmental quality and global cooperation. • Recognize the content and goal of species survival plans. • Discuss the validity and impact of scientific research on environmental issues related to human activities.
Doing Science: Politics and the Environment	*Overview: Doing Science: Politics and the Environment* *Study: Investigate Your Ecological Footprint*	• Formulate a hypothesis, and design a controlled experiment to test it.

Lesson and Duration	Activities	Objectives
3 hours	*Mastery Test: Investigate Your Ecological Footprint* *Lab: Investigate Your Ecological Footprint* *Discussion: Investigate Your Ecological Footprint*	• Identify common laboratory tools and techniques used to conduct the experiment you designed. • Conduct a scientific investigation, using a scientific process and demonstrating the proper and safe use of laboratory equipment. • Analyze data by using data tables, by calculating the range and average of a set of measurements, and by identifying sources of error. • Evaluate lab procedures and results in a discussion with your peers.
Wrap-Up: Politics and the Environment *2 hours*	*Review: Politics and the Environment* *Posttest: Politics and the Environment* *Teacher-Graded Posttest: Politics and the Environment*	• Review key ideas presented in the unit. • Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment. • Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

UNIT 4: SUSTAINABILITY FOR THE FUTURE

In this unit, you will compare methods of sustainability by application: food production, resource management, and societal development.

Lesson and Duration	Activities	Objectives
The Global Community *7 hours, 5 minutes*	*Overview: The Global Community* *Study: Human Cultures and Societies* *Mastery Test: Human Cultures and Societies* *Study: The Global Economy* *Mastery Test: The Global Economy* *Practice: The Global Community* *Project: Explore Sustainability for Your Local Environment*	• Examine the purpose and give examples of different types of human societies. • Recognize how different human cultures and societies value and manage the natural environment. • Define the nature of the global economy and the complex problems affecting it. • Determine how the availability of natural resources, occurrence of natural hazards, and changes in climate influence the global economy. • Evaluate possible solutions to complex real-world problems in a global economy. • Recognize the need for cooperative human behaviors in mitigating and preventing complex real-world problems. • Create and evaluate a plan that meets specific criteria and constraints to address environmental challenges that impact your community. • Break down a complex real-world problem into smaller, more manageable problems that can be solved through engineering.

Lesson and Duration	Activities	Objectives
Sustainable Practices *7 hours, 5 minutes*	*Overview: Sustainable Practices* *Study: Sustainable Food Production* *Mastery Test: Sustainable Food Production* *Study: Sustainable Resource Management* *Mastery Test: Sustainable Resource Management* *Study: Sustainable Societal Development* *Mastery Test: Sustainable Societal Development* *Checkup: Sustainable Practices* *Explore: Carbon Dioxide Sequestration*	• Recognize the goal of using sustainable practices in food production, resource management, and human societal development. • Analyze sustainable methods of food production, resource management, and human societal development. • Compare traditional practices used in food production, resource management, and human societal development with sustainable practices. • Identify advantages and disadvantages of using "green" and sustainable practices in food production, resource management, and human societal development. • Apply computer simulations to design, evaluate, and refine solutions for reducing the impacts of human activities on the environment and biodiversity. • Summarize the process of carbon dioxide sequestration and technologies that achieve it.
Doing Science: Sustainability for the Future *3 hours*	*Overview: Doing Science: Sustainability for the Future* *Study: Investigate Food Security* *Mastery Test: Investigate Food Security* *Lab: Investigate Food Security* *Discussion: Investigate Food Security*	• Formulate a hypothesis, and design a controlled experiment to test it. • Identify common laboratory tools and techniques used to conduct the experiment you designed.

Lesson and Duration	Activities	Objectives
		• Conduct a scientific investigation, using a scientific process and demonstrating the proper and safe use of laboratory equipment. • Analyze data by using data tables, by calculating the range and average of a set of measurements, and by identifying sources of error. • Evaluate lab procedures and results in a discussion with your peers.
Wrap-Up: Sustainability for the Future *2 hours*	*Review: Sustainability for the Future* *Posttest: Sustainability for the Future* *Teacher-Graded Posttest: Sustainability for the Future*	• Review key ideas presented in the unit. • Demonstrate mastery of concepts and skills from the unit by completing a computer-scored assessment. • Demonstrate mastery of concepts and skills from the unit by completing a teacher-scored assessment.

SEMESTER WRAP-UP

Lesson and Duration	Activities	Objectives
Semester Wrap-Up *2 hours, 40 minutes*	*Review: Semester Review* *End-of-Semester Test: Semester Exam* *Teacher-Graded End-of-Semester Test: Semester Exam*	• Review key ideas presented in the semester. • Demonstrate mastery of concepts and skills from the semester by completing a computer-scored assessment. • Demonstrate mastery of concepts and skills from the semester by completing a teacher-scored assessment.