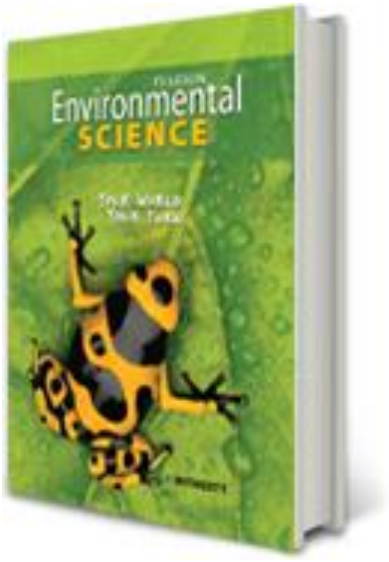
MOUNT VERNON CITY SCHOOL DISTRICT

Environmental Science Curriculum Guide



THIS HANDBOOK IS FOR THE IMPLEMENTATION OF THE ENVIRONMENTAL SCIENCE CURRICULUM IN MOUNT VERNON CITY SCHOOL DISTRICT (MVCSD).

2019-20

Mount Vernon City School District

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IMPORTANT DATES 2019-20

REPORT CARD

MARKING PERIOD	MARKING PERIOD BEGINS	INTERIM PROGRESS REPORTS	MARKING PERIOD ENDS
MP 1	September 4, 2019	October 4, 2019	November 8, 2019
MP 2	November 12, 2019	December 13, 2019	January 31, 2020
MP 3	February 3, 2020	March 13, 2020	April 17, 2020
MP 4	April 27, 2020	May 21, 2020	June 26, 2020

The **Parent Notification Policy** states "Parent(s) / guardian(s) or adult students are to be notified, *in writing*, at any time during a grading period when it is apparent - that the student may fail or is performing unsatisfactorily in any course or grade level. Parent(s) / guardian(s) are also to be notified, *in writing*, at any time during the grading period when it becomes evident that the student's conduct or effort grades are unsatisfactory."

ENVIRONMENTAL SCIENCE COURSE DESCRIPTION

Americans are increasingly confronted with questions in their public and personal lives for which scientific information and ways of thinking are necessary for informed decision-making. This course will provide students with the opportunity to analyze environmental issues from the viewpoints of a variety of interested parties. Students will learn to gather and interpret data important to the understanding of an environmental issue by participating in role-plays in the context of an environmental problem. Students who successfully complete the course earn ½ unit of science elective credit.

Course Goals:

- Identify the values, beliefs, and interests of others as they relate to an environmental problem.
- Analyze an environmental issue from the viewpoints of a variety of interested parties.
- Gather and interpret data important to the understanding of an environmental issue.
- Participate in role plays in the context of an environmental problem.
- Identify ways to take action on environmental issues.
- Critically think through and formulate positions in regards to environmental issues based on gathered evidence and research.
- Apply research and data to the given authentic situations.
- Evaluate the most effective means of delivering the information.
- Communicate the results of the work.

Outcomes of Course:

Students will know and be able to analyze environmental issues by identifying all of the stakeholders and their positions. This will be evidenced by students doing the following:

1. Answer the essential question using one of the following strategies:
    - Public service announcement (video)
    - Power Point presentation
    - Surveying/Interviewing the community
    - Make a website

- Written essay with supporting evidence
- Photographic display
- Any other option with prior approval

2. Critically analyze reports, editorials and articles. Students will keep a weekly journal of newspaper and journal reviews. The criteria include:
   - It must be an environmental issue or topic connected to New York.
   - The weekly journal entry must be in a notebook or separate binder.
   - The entry must include: article title, author, author credentials. Editor, date, and source of article.
   - The article must be attached to the journal review.
   - The review must include the topic of the article and main idea.
   - The review must explain how the article is directly or indirectly related to New York.
   - The review must explain the point of view in which the article is written.
   - Include your position on the topic.

ENVIRONMENTAL SCIENCE CORE CURRICULUM

NYS MST PERFORMANCE INDICATORS THAT RELATE TO THE ECOLOGY: ENVIRONMENTAL ISSUES CURRICULUM

Standard 1: Scientific Inquiry KI 1
The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.

Standard 1: Scientific Inquiry KI 3
The observations made while testing proposed explanations, when analyzed using conventional and invented methods, provide new insights into phenomena.

Standard 1: Scientific Inquiry PI 3.5
Develop a written report for public scrutiny that describes the proposed explanation, including a literature review, the research carried out, its results, and suggestions for further research.

Standard 4: Living Environment PI 1.1
Explain how diversity of populations within ecosystems relates to the stability of ecosystems.
Major Understandings:

1.1a Populations can be categorized by the function they serve. Food webs identify the relationships among producers, consumers, and decomposers carrying out either autotropic or heterotropic nutrition.

1.1b An ecosystem is shaped by the nonliving environment as well as its interacting species. The world contains a wide diversity of physical conditions, which creates a variety of environments.

1.1c In all environments, organisms compete for vital resources. The linked and changing interactions of populations and the environment compose the total ecosystem.

1.1d The interdependence of organisms in an established ecosystem often results in approximate stability over hundreds of years. For example, as one population increases, it is held in check by one or more environmental factors or another species.

1.1e Ecosystems, like many other complex systems, tend to show cyclic changes around a state of approximate equilibrium.

1.1f Every population is linked, directly or indirectly, with many others in an ecosystem. Disruptions in the numbers and types of species and environmental changes can upset ecosystem stability.

Standard 4: Living Environment PI 6.1
Explain factors that limit growth of individuals and populations.
Major Understandings:

6.1d The number of organisms any habitat can support (carrying capacity) is limited by the available energy, oxygen, and minerals, and by the ability of ecosystems to recycle the residue of dead organisms through the activities of bacteria and fungi.

6.1e In any particular environment, the growth and survival of organisms depend on the physical conditions including light intensity, temperature range, mineral availability, soil/rock type, and relative acidity (pH).

6.1f Living organisms have the capacity to produce populations of unlimited size, but environments and resources are finite. This has profound effects on the interactions among organisms.

6.1g Relationships between organisms may be negative, neutral, or positive. Some organisms may interact with one another in several ways. They may be in a producer/consumer, predator/prey, or parasite/host relationship; or one organism may cause disease in, scavenge, or decompose another.

Standard 4: Living Environment PI 7.2

Explain the impact of technological development and growth in the human population on the living and nonliving environment.

Major Understandings:

7.2a Human activities that degrade ecosystems result in a loss of the living and nonliving environment. For example, the influence of humans on other organisms occurs through land use and pollution. Land use decreases the space and resources available to other species, and pollution changes the chemical composition of air, soil, and water.

7.2b When humans alter ecosystems either by adding or removing specific organisms, serious consequences may result. For example, planting large expenses of one crop reduces the biodiversity of the area.

Standard 4: Physical Setting PI 1.2

Major Understanding:

1.2g Earth has continuously been recycling water since the outgassing of water early in its history. This constant recirculation of water at and near Earth's surface is described by the hydrologic (water) cycle.

- Water is returned from the atmosphere to Earth's surface by precipitation. Water returns to the atmosphere by evaporation or transpiration from plants. A portion of the precipitation becomes runoff over the land or infiltrates from plants. A portion of the precipitation becomes runoff over the land or infiltrates into the ground to become stored in the soil or groundwater below the water table. Soil capillarity influences these processes.
- The amount of precipitation that seeps into the ground or runs off is influenced by climate, slope of the land, soil, rock type, vegetation, land use, and degree of saturation.
- Porosity, permeability, and water retention affect runoff and infiltration.

Standard 4: Living Environment PI 7.1

Describe the range of interrelationships of humans with the living and nonliving environment.

Major Understandings:

7.1a The Earth has finite resources; increasing human consumption of resources places stress on the natural processes that renew some resources and deplete those resources that cannot be renewed.

7.1b Natural ecosystems provide an array of basic processes that affect humans. Those processes include but are not limited to: maintenance of the quality of the atmosphere, generation of soils, control of the water cycle, removal of wastes, energy flow, and

recycling of nutrients. Humans are changing many of these basic processes and the changes may be detrimental.

7.1c Human beings are part of the Earth's ecosystems. Human activities can, deliberately of inadvertently, alter the equilibrium in ecosystems. Humans modify ecosystems as a result of population growth, consumption, and technology. Human destruction of habitats through direct harvesting, pollution, atmospheric changes, and other factors is threatening current global stability, and if not addressed, ecosystems may be irreversibly affected.

Standard 4: Living Environment PI 7.2

Explain the impact of technological development and growth in the human population on the living and nonliving environment.

Major Understandings:

7.2a Human activities that degrade ecosystems result in a loss of diversity of the living and nonliving environment. For example, the influence of humans on other organisms occurs through land use and pollution. Land use decreases the space and resources available to other species, and pollution changes the chemical composition of air, soil, and water.

7.2b When humans alter ecosystems either by adding or removing specific organisms, serious consequences may result. For example, planting large expanses of one crop reduces the biodiversity of the area. 7.2c Industrialization brings an increased demand for and use of energy and other resources including fossil and nuclear fuels. This usage can have positive and negative effects on humans and ecosystems.

Standard 4: Living Environment PI 7.3

Explain how individual choices and societal actions can contribute to improving the environment.

Major Understandings:

7.3a Societies must decide on proposals which involve the introduction of new technologies. Individuals need to make decisions which will assess risks, costs, benefits, and trade-offs.

7.3b The decisions of one generation both provide and limit the range of possibilities open to the next generation.

Standard 6: Interconnectedness: Common Themes KI 5

Identifying patterns of change is necessary for making predictions about future behavior and conditions

- Use graphs to make predictions
- Use graphs to identify patterns and interpret experimental data

Standard 7: Interdisciplinary Problem Solving KI 2

Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results. If students are asked to do a project, then the project would require students to:

- Work effectively
- Gather and process information

- Generate and analyze ideas
- Observe common themes
- Realize ideas
- Present results

Standard 7: Interdisciplinary Problem Solving PI 1.1
Analyze science/technology/society problems and issues on a community, national, or global scale and plan and carry out a remedial course of action.

Standard 7: Interdisciplinary Problem Solving PI 1.2
Analyze and quantify consumer product data, understand environmental and economic impacts, develop a method for judging the value and efficacy of competing products, and discuss cost-benefit and risk-benefit trade-offs made in arriving at the optimal choice.

Standard 7: Interdisciplinary Problem Solving PI 1.3
Design solutions to real-world problems on a community, national, or global scale, using a technological design process that integrates scientific investigation and rigorous mathematical analysis of the problem and of the solution.

ENVIRONMENTAL SCIENCE PACING GUIDE

This guide using *Environmental Science Your World Your Turn* by Pearson (ISBN-10: 0-13-372475-1) was created to provide teachers with a time frame to complete the Environmental Science Curriculum.

Unit 1—Introduction

Enduring Understanding: We can use science to study and understand the complex interactions between humans and their environments.

Project: A Ballooning Issue

Chapter	Lesson	I can…	Vocabulary	Activity
Chapter 1. An Introduction to Environmental Science **Big Question:** How do scientists uncover, research, and solve environmental problems?	1.1 Our Island, Earth	1. I can explain the focus of environmental science. 2. I can describe the recent trends in human population and resource consumption.	Environment, environmental science, environmentalism, natural resource, renewable natural resource, nonrenewable natural resource, sustainable, fossil fuel, ecological footprint	**Central Case:** Fixing a Hole in The Sky Activity: The Lesson of Easter Island
	1.2 The Nature of Science	1. 1. I can explain what science is. 2. I can describe the process of science.	Hypothesis, prediction, independent variable, controlled student, data	
	1.3 The Community of Science *Quick Lab: Can You Repeat That?*	1. I can describe the major roles of the scientific community in the process of science. 2. I can explain the study of environmental ethics.	Peer reviews, theory, ethics, environmental ethics	
Chapter Exam				

SEPTEMBER

Unit 1—Introduction **Enduring Understanding:** We can use science to study and understand the complex interactions between humans and their environments. **Project: A Ballooning Issue**					**OCTOBER**
Chapter 2. Environmental Policy and Economics **Big Question:** How can we best balance our own interests and needs with the health of the environment?	2.1 Economics *Quick Lab: Cost-Benefit Analysis*	1. I can describe two basic concepts of economics. 2. I can explain the relationship between economics and the environment. 3. I can describe ways that economics are working toward sustainability	Economics, supply, demand, cost-benefit analysis, ecological economics, environmental economics, non-market failure, ecolabeling	**Central case:** Cleaning the Tides of San Diego and Tijuana Activity: Fighting for Clean Water	
	2.2 United States Environmental Policy	1. I can explain the purpose of environmental policy. 2. I can describe the history of US environmental policy. 3. I can describe the direction of current US environmental policy.	Policy, environmental policy, Environmental Impact Statement		
	2.3 International Environmental Policy and Approaches	1. I can identify major international institutions involved in environmental policy. 2. I can discuss different approaches to environmental policy. 3. I can list the steps involved in the environmental policy process.	Command-and-control approach, subsidy, green tax, cap-and-trade, lobbying		
Chapter Exam					

<table>
<tr><td colspan="5">Unit 1—Introduction
Enduring Understanding: We can use science to study and understand the complex interactions between humans and their environments.
Project: A Ballooning Issue</td><td rowspan="5">OCTOBER</td></tr>
<tr><td rowspan="3">Chapter 3. Earth’s Environmental Systems
Big Question: How do the nonliving parts of Earth’s systems provide the basic materials to support life?</td><td>3.1 Matter and the Environment</td><td>1. I can differentiate among an atom, an element, a molecule and a compound.
2. I can discuss how various macromolecules are essential to life.
3. I can identify some unusual properties of water.</td><td>Matter, atom, element, nucleus, molecule, compound, hydrocarbon, solution, macromolecule, protein, nucleic acid, carbohydrate, lipid, pH</td><td rowspan="3">Central Case: The Gulf of Mexico’s Dead Zone

Activity: Nutrients</td></tr>
<tr><td>3.2 Systems in Environmental Science</td><td>1. I can describe two major ways that Earth Systems interact.
2. I can define Earth’s geosphere, lithosphere, biosphere, atmosphere and hydrosphere.</td><td>Feedback loop, erosion, geosphere, lithosphere, biosphere, atmosphere, hydrosphere</td></tr>
<tr><td>3.3 Earth’s Spheres

Quick Lab: Distribution of Earth’s Water</td><td>1. I can describe the parts of Earth’s geosphere.
2. I can describe Earth’s biosphere and atmosphere.
3. I can discuss the water cycle.</td><td>Crust, mantle, core, tectonic plate, landform, deposition, evaporation, transpiration, precipitation, condensation, aquifer, groundwater</td></tr>
<tr><td></td><td>3.4 Biogeochemical Cycles</td><td>1. I can explain how the law of conservation of matter applies to the behavior of nutrient in the environment.
2. I can describe the carbon cycle.
3. I can describe the events of the phosphorous cycle.
4. I can explain the important of bacteria to the nitrogen cycle.</td><td>law of conservation of matter, nutrient, Biogeochemical Cycle, primary producers, photosynthesis, consumer, decomposer, cellular respiration, eutrophication, nitrogen fixation</td></tr>
<tr><td colspan="5">Chapter Exam</td></tr>
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Unit 2—Ecology

Enduring Understanding: Life on Earth depends on interactions among organisms and between organisms and their environment.

Project: Seeing the Past, Foreseeing the Future

Chapter 4. Population Ecology **Big Question:** How do changes in population size and ecosystems affect each other?	4.1 Studying Ecology	1. I can describe the different levels of organization studied by ecologists. 2. I can explain the difference between biotic and abiotic factors. 3. I can discuss how an organism's habitat relates to its survival	Ecology, species, population, community, ecosystem, biosphere, biotic factors, abiotic factors, factor, habitat	**Central Case:** Finding Gold in a Costa Rican Cloud Forest Activity: The Cloudless Forest	NOVEMBER
	4.2 Describing Populations	1. I can explain the usefulness of tracking population size. 2. I can define population density. 3. I can describe three ways populations can be distributed. 4. I can explain what age structure diagrams tell you about a population.	Population size, population density, population distribution, age structure, age structure diagram, sex ratio		
	4.3 Population Growth	1. I can describe the factors that influence a population growth rate. 2. I can explain exponential growth and logistic growth. 3. I can explain how limiting factors and biotic potential affect population growth.	Survivorship curve, immigration, emigration, migration, exponential growth, limiting factor, carrying capacity, logistic growth, density-dependent factor, density-independent factor, biotic potential		
Chapter Exam					

Unit 2—Ecology

Enduring Understanding: Life on Earth depends on interactions among organisms and between organisms and their environment.

Project: Seeing the Past, Foreseeing the Future

Chapter 5. Evolution and Community Ecology **Big Question:** How do organisms affect each other's survival and environment?	5.1 Evolution	1. I can describe the four primary mechanisms of biological evolution. 2. I can describe how speciation and extinction affect the diversity of life on Earth.	Evolution, gene, mutation, generic drift, natural selection, fitness, adaptation, artificial selection, speciation, extinction	**Central Case:** Black and White, and Spread All Over Activity: A Broken Mutualism	NOVEMBER-DECMBER
	5.2 Species Interactions	1. I can discuss the factors that influence an organism's niche. 2. I can compare and contrast predation, parasitism and herbivory. 3. I can describe mutualism and commensalism.	Niche, tolerance resource, partitioning, predation, coevolution, parasitism, symbiosis, herbivory, mutualism commensalism		
	5.3 Ecological Communities	1. I can describe the four primary mechanisms of biological evolution. 2. I can explain the effect of inefficient energy transfer on community structure. 3. I can describe how feeding relationships can have both direct and indirect effects on community members.	Primary producers, photosynthesis, chemosynthesis, consumer, cellular respiration, herbivore, carnivore, omnivore, detrivore, decomposer, trophic level, biomass, food chain, food web, keystone species		
	5.4 Community Stability *Quick Lab: Successful Succession*	1. I can describe what happens to a community after a disturbance. 2. I can explain the conditions necessary for a species to become invasive.	Succession, primary succession, pioneer species, secondary succession, invasive species		
Chapter Exam					

Unit 2—Ecology **Enduring Understanding:** Life on Earth depends on interactions among organisms and between organisms and their environment. **Project: Seeing the Past, Foreseeing the Future**					DECEMBER
Chapter 6. Biomes and Aquatic Ecosystems **Big Question:** How does the environment affect where and how an organism lives?	6.1 Defining Biomes	1. I can explain how biomes are characterized. 2. I can describe how net primary production varies among biomes.	Biomes, climate, weather, climatograph, net primary production	**Central Case:** Too Much of a Good Thing Activity: Should Elephants Culling Be Allowed?	
	6.2 Biomes	1. I can explain how organisms are adapted to the conditions of their biomes.	Canopy, emergent layer, understory, epiphyte, deciduous, estivation, coniferous, hibernation, permafrost		
	6.3 Aquatic Ecosystems	1. I can describe the criteria ecologists use to classify aquatic ecosystems. 2. I can list the major categories of freshwater ecosystems. 3. I can explain the ecological importance of estuaries. 4. I can list the three major zones of the ocean.	Salinity, photic zone, aphotic zone, benthic zone, littoral zone, limnetic zone, wetland, flood plain, estuary, upwelling		
Chapter Exam					

Unit 2—Ecology **Enduring Understanding:** Life on Earth depends on interactions among organisms and between organisms and their environment. **Project: Seeing the Past, Foreseeing the Future**					**JANUARY**
Chapter 7. Biodiversity and Conservation **Big Question:** Why is it important to protect biodiversity?	7.1 Our Planet of Life	1. I can differentiate the components of biodiversity. 2. I can explain two ways in which biodiversity varies across groups of geography. 3. I can describe the economic benefits of biodiversity.	Biodiversity, species diversity, genetic diversity, ecosystem diversity	**Central Case:** Saving the Siberian Tiger Activity: A Couple of Birds Make Big Comebacks	
	7.2 Extinction and Biodiversity Loss	1. I can describe how biodiversity is monitored and explain current biodiversity trends. 2. I can list the major causes of biodiversity loss	Extirpation, endangered species, threatened species, habitat fragmentation, poaching		
	7.3 Protecting Biodiversity	1. I can explain legal actions nations can take to protect biodiversity. 2. I can explain the goal of the Species Survival Plans. 3. I can describe three strategies for managing whole ecosystems and habitats.	Endangered Species Act (ESA), captive breeding, Species Survival Plan (SSP), biodiversity hotspot, endemic		
Midterm Exam					

Unit 3—Humans and the Environment **Enduring Understanding:** Humans impact the global environment more than any other species alive today. **Project: Charrette for Sustainability**					FEBRUARY
Chapter 8. Human Population **Big Question:** How does the human population affect the environment?	8.1 Trends in Human Population Growth	1. I can describe how technological advances have contributed to human population growth. 2. I can explain recent trends in population growth. 3. I can identify characteristics of human population that are studied by demographers.	Industrial Revolution, Infant mortality, life expectancy, growth rate, demography	**Central Case:** China's One-Child Policy Activity: The US Census	
	8.2 Predicting Population Growth	1. I can describe total fertility rates and replacement fertility. 2. I can explain how the age structure and sex ratio of a population define its potential for growth. 3. I can describe the demographic transition. 4. I can discuss social factors that affect population growth.	Total fertility rate, replacement fertility, demographic transition		
	8.3 Humans and Their Environments	1. I can describe how humans impact their environments. 2. I can discuss the negative and positive impacts of technology.	Wealth gap		
Chapter Exam					

Unit 3—Humans and the Environment

Enduring Understanding: Humans impact the global environment more than any other species alive today.

Project: Charrette for Sustainability

Chapter 9. Environmental Health **Big Question:** What is the relationship between environmental health and our own health?	9.1 An Overview of Environmental Health	1. I can list the types of environmental health hazards. 2. I can compare and contrast epidemiology and toxicology. 3. I can describe the reasons why individuals respond differently to the same environmental hazards. 4. I can discuss risk assessment.	Environmental health, hazard, pathogen, epidemiology, toxicology, toxicity, dose, response, close-response relationship, risk, risk assessment	**Central Case:** The Rise and Fall--and Rise?-- of DDT Activity: Should BPA Use Be Regulated	**FEBRUARY - MARCH**
	9.2 Biological and Social Hazards	1. I can describe how infectious diseases spread. 2. I can explain why emerging diseases are important to monitor and control. 3. I can differentiate between social hazards that are lifestyle choices and those that cannot be controlled.	Infectious disease, emerging disease		
	9.3 Toxins in the Environment	1. I can explain what make chemicals hazardous. 2. I can discuss how chemical hazards affect human health. 3. I can list some indoor chemical hazards. 4. I can discuss where chemical hazards can be found in the environment. 5. I can describe biomagnification.	Pollution, carcinogen, teratogen, neurotoxin, asbestos, radon, bioaccumulation, biomagnification		
	9.4 Natural Disasters	1. I can discuss how earthquakes affect structures on Earth surface. 2. I can discuss how volcanoes affect human lives and property. 3. I can describe tornadoes, hurricanes and thunderstorms. 4. I can discuss the dangers of avalanches	Earthquake, landslide, tsunami, volcano, tornado, hurricane, thunderstorm, avalanche		
Chapter Exam					

<table>
<tr><td colspan="5">Unit 3—Humans and the Environment
Enduring Understanding: Humans impact the global environment more than any other species alive today.
Project: Charrette for Sustainability</td><td rowspan="5">MARCH</td></tr>
<tr><td rowspan="3">Chapter 10. Urbanization

Big Question: How can we balance our needs for housing and jobs with the needs of the environment?</td><td>10.1 Land Use and Urbanization</td><td>1. I can differentiate between land cover and land use, and describe how people affect both.
2. I can explain how and where urbanization occurs.
3. I can describe the environmental impacts of urbanization.</td><td>Land cover, land use, urban area, rural area, urbanization, infrastructure, heat island</td><td rowspan="3">Central Case: Growing Pains in Portland, Oregon

Activity: Geographic Information Systems</td></tr>
<tr><td>10.2 Sprawl</td><td>1. I can describe the contributors to sprawl and its patterns.
2. I can explain the impacts sprawl has on an area.</td><td>sprawl</td></tr>
<tr><td>10.3 Sustainable Cities</td><td>1. I can describe four different component of city planning.
2. I can discuss the negative and positive impacts of technology.
3. I can explain the importance of open space to a livable city.
4. I can differentiate green building from conventional buildings.
5. I can discuss the progress toward sustainability some cities have made and its importance to the world.</td><td>City planning, geographic information system, zoning, urban growth boundary, smart growth, ecological restoration, greenway</td></tr>
<tr><td colspan="5">Chapter Exam</td></tr>
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Unit 5—Towards a Sustainable Future **Enduring Understanding:** Today's decisions define our future environment. **Project: Senate Hearing on Resource Management**					
Chapter 16. Global Climate Change **Big Question:** What are the causes and consequences of a warming Earth?	16.1 Our Dynamic Climate *Quick Lab: Does Latitude Affect the Sun's Rays*	1. I can describe factors that affect how the sun warms Earth. 2. I can discuss the role of wind patterns in determining climate. 3. I can explain how the oceans affect climate. 4. I can describe how climate is affected by topography, volcanoes, regional vegetation and periodic changes in Earth's orbit.	Greenhouse effect, greenhouse gas, thermohaline circulation, El Nino, topography	**Central Case:** Rising Seas May Flood the Maldive Islands Activity: Climate clues in Ice	APRIL
	16.2 Global Warming	1. I can identify evidence of global warming. 2. I can explain three methods used to study climate change. 3. I can state the probable cause of global climate change.	Global climate change, global warming, proxy indicator, climate model, fossil fuel		
	16.3 Effects of Climate Change	1. I can state ways in which the warming atmosphere affects ecosystems and organisms. 2. I can explain how climate change is affecting people now. 3. I can predict future effects of climate change on people.	Coral bleaching		
	16.4 Responding to Climate Change	1. I can list ways to reduce greenhouse gases related to the use and generation of electricity. 2. I can describe some of the ways of reducing greenhouse gases related to transportation. 3. I can describe other strategies for reducing greenhouse gases. 4. I can explain how nations are working together to try to address climate change.	Carbon footprint, carbon tax, carbon offset, carbon sequestration, Kyoto protocol		
Chapter Exam					

Unit 5—Towards a Sustainable Future
Enduring Understanding: Today's decisions define our future environment.
Project: Senate Hearing on Resource Management

Chapter 17. Nonrenewable Energy **Big Question:** Can we depend on nonrenewable energy sources for our energy needs?	17.1 Energy: An Overview Quick Lab: Where's the Energy	1. I can define energy and differentiate between kinetic and potential energy. 2. I can identify different forms of energy. 3. I can describe how human society uses energy resources.	Energy, kinetic energy, potential energy, combustion, energy efficiency, renewable energy, nonrenewable energy, electricity	**Central Case:** Oil or Wilderness on Alaska's North Slope? Activity: Using coal to Generate Electricity	APRIL - MAY
	17.2 Fossil Fuels	1. I can explain how fossil fuel formed. 2. I can describe the used of coal and how it is removed from the ground. 3. I can describe the uses of oil and how it is extracted. 4. I can explain the characteristics and use of natural gas. 5. I can predict the future of fossil fuels.	Strip mining, subsurface mining, petroleum, petrochemical, oil sands, oil shale, methane hydrate		
	17.3 Harmful Effects of Fossil Fuels	1. I can explain how pollutants released by fossil fuels damage health and the environment. 2. I can describe the environmental and health effects of mining and drilling. 3. I can explain the implications of dependence on foreign nations for fossil fuels. 4. I can explain why energy conservation is important	Acid drainage, energy conservation		
	17.4 Nuclear Power	1. I can relate nuclear fission on the production of energy. 2. I can describe how a nuclear power plant generates electricity. 3. I can identify the advantages and disadvantages of nuclear power. 4. I can contrast nuclear fusion with nuclear fission, and explain the issues related to nuclear fusion.	Nuclear energy, nuclear fission, nuclear reactor		
Chapter Exam					

Unit 5—Towards a Sustainable Future Enduring Understanding: Today's decisions define our future environment. Project: Senate Hearing on Resource Management					
Chapter 18. Renewable Energy Alternatives **Big Question:** What are the potential uses and limitations of renewable energy sources	18.1 Biomass and Geothermal Energy	1. I can explain the benefits and current status of renewable energy resources. 2. I can define biomass energy and explain how it is used. 3. I can describe how geothermal energy is harnessed and used.	Biomass energy, biofuel, biopower, geothermal energy, ground source heat pump	**Central Case:** Germany's Big Bet on Renewable Energy Activity: Are Biofuels Better for the Environment?	MAY
	18.2 Hydroelectric and Ocean Energy	1. I can explain how river water can be used to generate electricity. 2. I can identify benefits and costs of hydropower. 3. I can describe how energy from the ocean can generate electricity.	Hydropower, tidal energy, ocean thermal energy conversion		
	18.3 Solar and Wind Energy	1. I can describe techniques for using solar energy to heat buildings and generate electricity. 2. I can analyze the benefits and costs of solar energy. 3. I can explain how wind energy can be used to produce electricity. 4. I can analyze the benefits and costs of wind energy.	Passive solar heating, active solar heating, flat-plate solar collector, photovoltaic cell, concentrating solar power, wind turbine, wind farm		
	18.4 Energy from Hydrogen	1. I can describe how hydrogen fuel can be produced. 2. I can explain the way fuel cells work and how they are used.	Electrolysis, fuel cell		
Chapter Exam					

Unit 5—Towards a Sustainable Future Enduring Understanding: Today's decisions define our future environment. Project: Senate Hearing on Resource Management					JUNE
Chapter 19. Waste Management **Big Question:** How do our choices as consumers and waste producers affect our environment?	19.1 Municipal and Industrial Solid Waste	1. I can identify the three categories of waste. 2. I can describe conventional waste disposal methods.	Waste, municipal solid waste, industrial waste, hazardous waste, sanitary landfill, leachate, incineration	**Central Case:** Transforming New York's Fresh Kills Landfill Activity: The Recycling Process	
	19.2 Minimizing Solid Waste *Quick Lab: Reduce, Reuse, Recycle*	1. I can discuss the importance of reducing waste. 2. I can describe how composting and recycling help reduce the amount of waste.	Source reduction, biodegradable, composting, recycling, material recovery facility		
	19.3 Hazardous Waste	1. I can define hazardous waste. 2. I can describe some of the sources of hazardous wastes. 3. I can describe current methods for hazardous waste disposal. 4. I can describe the danger of radioactive wastes. 5. I can identify agencies that regulate hazardous waste.	e-waste, surface impoundment, deep-well injection, radioactive waste, Superfund		
Final Exam					

<table>
<tr><th colspan="5">Students with Disabilities (SWDs)</th></tr>
<tr><td colspan="2">Modifications
Pre-teach vocabulary
Use picture vocabulary
Picture examples of safety measures posted
Pictures for each category of science
Scaffold Depth of Knowledge questions
Provide copy of notes in ”cloze” form
Peer partner
Extended time for written tasks/verbal response
Break long tasks over multiple days
Allow for multiple ways to respond (verbal, written, response board, scribe)
Provide mock/model of performance task
Model use of graphic organizers (fade until mastery)
Modify informational text to shorter passages
Provide model of exemplar lab write-up
Provide interactive notebook
Present complex tasks in multiple ways
Model steps to read, interpret, and construct graphs
Multiple opportunities to perform to repeat labs
Provide advance organizer of class tasks</td><td>Assistive Technology:
Computer for lengthy writing tasks
Audio textbook
Videos to clarify concepts
Recording device to record class lecture/discussions
Other
Arrange seating for maximum engagement and minimum distraction
Accessible lab space (counter level)</td><td colspan="2">Assessment
Scaffold written assignments
Individual criteria for success
Provide review packet
Modify the number of questions
Provide model of the task
Provide multiple options for projects
Practice calculations with sample problem before assessing student</td></tr>
<tr><th colspan="5">ENL</th></tr>
<tr><td>Listening
Build Background Knowledge
Audio</td><td>Speaking
Sentence Frames
Academic conversation Starters</td><td>Reading
Supplementary Texts
Visual Aids
Video
Standards-based questions</td><td>Writing
Sentence Frames
Graphic Organizers
Standards-based sentence stems</td><td>Accommodations
Extended time
Directions read 3x
Oral interpretation
Translated version of test (may have both English and other)
Responses in home language</td></tr>
</table>

SYSTEMATIC DESIGN OF A SCIENCE LESSON

What are the components of a Science Lesson?

Summary of the 5E Instructional Model

Phase	Summary
Engagement	The teacher or a curriculum task accesses the learners' prior knowledge and helps them become engaged in a new concept through the use of short activities that promote curiosity and elicit prior knowledge. The activity should make connections between past and present learning experiences, expose prior conceptions, and organize students' thinking toward the learning outcomes of current activities.
Exploration	Exploration experiences provide students with a common base of activities within which current concepts (i.e., misconceptions), processes, and skills are identified and conceptual change is facilitated. Learners may complete lab activities that help them use prior knowledge to generate new ideas, explore questions and possibilities, and design and conduct a preliminary investigation.
Explanation	The explanation phase focuses students' attention on a particular aspect of their engagement and exploration experiences and provides opportunities to demonstrate their conceptual understanding, process skills, or behaviors. This phase also provides opportunities for teachers to directly introduce a concept, process, or skill. Learners explain their understanding of the concept. An explanation from the teacher or the curriculum may guide them toward a deeper understanding, which is a critical part of this phase.
Elaboration	Teachers challenge and extend students' conceptual understanding and skills. Through new experiences, the students develop deeper and broader understanding, more information, and adequate skills. Students apply their understanding of the concept by conducting additional activities.
Evaluation	The evaluation phase encourages students to assess their understanding and abilities and provides opportunities for teachers to evaluate student progress toward achieving the educational objectives.

IMPORTANT NOTICE

- Writing assignments at the end of the lesson (closure) bring great benefits. Not only do they enhance students' general writing ability, but they also increase both the understanding of content while learning the specific vocabulary of the disciplines.
- Demonstration (using manipulatives) must be incorporated in all lessons. With students actively involved in manipulating materials, interest in science will be aroused. Using manipulative materials in teaching science will help students learn:
  a. to relate real world situations to science symbolism.
  b. to work together cooperatively in solving problems.
  c. to discuss scientific ideas and concepts.
  d. to verbalize their scientific thinking.
  e. to make presentations in front of a large group.
  f. that there are many different ways to solve problems.
  g. that problems can be symbolized in many different ways.
  h. that they can solve problems without just following teachers' directions.

SCIENCE GRADING POLICY

This course of study includes different components, each of which are assigned the following percentages to comprise a final grade. I want you--the student--to ***understand that your grades are not something that I give you, but rather, a reflection of the work that you give to me.***

1.	**Exams**	→	**35%**
2.	**Quizzes**	→	**15%**
3.	**Homework**	→	**10%**
4.	**Labs, Projects, Literacy Tasks, Presentations, Portfolios**	→	**20%**
5.	**Classwork / Class Participation**	→	**20%**

- *Class participation will play a significant part in the determination of your grade. Class participation will include the following: attendance, punctuality to class, contributions to the instructional process, effort, work in the laboratory, contributions during small group activities and attentiveness in class.*

Important Notice

As per MVCSD Board Resolution 06-71, the **Parent Notification Policy** states "Parent(s) / guardian(s) or adult students are to be notified, *in writing,* at any time during a grading period when it is apparent - that the student may fail or is performing unsatisfactorily in any course or grade level. Parent(s) / guardian(s) are also to be notified, *in writing,* at any time during the grading period when it becomes evident that the student's conduct or effort grades are unsatisfactory.

SETUP OF THE SCIENCE CLASSROOM

I. Prerequisites for a Science Classroom

A Bulletin Board is meant to display necessary information related to the class itself. Displayed on the Bulletin Boards should be the following;

- Teacher Schedule
- Class List
- Seating Chart
- Code of Conduct / Discipline
- School Policies – dress code, attendance, important dates, etc.
- Grading Policy
- Safety and Laboratory Procedures
- Science Diagrams
- Extra Help Schedule

II. Updated Student Work

A section of the classroom must display *recent student work*. This can be of any type of assessment, graphic organizer, and writing activity. Teacher feedback must be included on student's work.

III. Board Set-Up

Every day, teachers must display the **Objective, NYS Standard(s) and Engagement task.**

Student's Name:	**School:**
Teacher's Name:	**Date:**
Objective:	
NYS Standard(s):	
Engagement:	

IV. Spiraling Homework

Homework is used to reinforce daily learning objectives. The secondary purpose of homework is to reinforce objectives learned *earlier in the year*. The assessments are **cumulative,** spiraling homework requires students to review coursework throughout the year.

WORD WALLS ARE DESIGNED …

- to promote group learning.
- to support the teaching of important general principles about words and how they work.
- to foster reading and writing in content area.
- to provide reference support for children during their reading and writing.
- to promote independence on the part of young students as they work with words.
- to provide a visual map to help children remember connections between words and the characteristics that will help them form categories.
- to develop a growing core of words that become part of their vocabulary.

IMPORTANT NOTICE

- A science word wall must be present in every science classroom.

Sample Science Word Wall

Process Skills	Plants	Soils	Animals
classify	root	soil	inherit
measure	stem	humus	trait
predict	leaf	topsoil	mammal
observe	seed	clay	bird
record	germinate	loam	amphibian
infer	seedling	resource	gills
variable	photosynthesis	conservation	fish
compare	chlorophyll	strip cropping	scales
	cotyledon	contour plowing	reptile
			metamorphosis
			cycle

Habitats	Food Chains	Rocks and Minerals	
environment	interact	mineral	valley
ecosystem	producer	rock	canyon
population	consumer	crust	plain
community	decomposer	mantle	plateau
habitat	food chain	core	barrier island
forest	energy pyramid	igneous rock	weathering
deciduous forest	food web	sedimentary rock	erosion
tropical rain forest	predator	metamorphic rock	glacier
coastal forest	prey	rock cycle	earthquake
coniferous forest		fossil	volcano
desert		geologist	flood
salt water		landform	natural disaster
fresh water		mountain	

SCIENCE CLASSROOM AESTHETICS

"PRINT–RICH" ENVIRONMENT CONDUCIVE TO LEARNING

TEACHER NAME: _____

PERIOD: _____

ROOM: _____

CHECKLIST

	YES	NO
• **Teacher Schedule**	☐	☐
• **Class List**	☐	☐
• **Seating Chart**	☐	☐
• **Code of Conduct / Discipline**	☐	☐
• **Grading Policy**	☐	☐
• **List of Core Laboratories**	☐	☐
• **Safety and Laboratory Procedures**	☐	☐
• **Science Diagrams, Posters, Displays**	☐	☐
• **Updated Student Work (Projects, Assessments, Writing, etc.)**	☐	☐
• **Updated Student Portfolios**	☐	☐
• **Updated Word-Wall**	☐	☐
• **Updated Lab Folder**	☐	☐
• **Organization of Materials**	☐	☐
• **Cleanliness**	☐	☐

Principal Signature: _____ **Date:** _____

Administrator Signature: _____ **Date:** _____

Mount Vernon City School District
Science Department
Formal Lab Report Format

Laboratory reports are the vehicle in which scientific information is passed on from the experimenter to others who have an interest in the scientific study. It is therefore very important that each student enrolled in a science class at University High School learn the proper format and procedure for writing a scientific report.

The following is a brief summary of what information is to be included in an acceptable laboratory report. **Not all experiments will include all of the sections shown below**. If your experiment (or your teacher) does not call for certain parts of the report format simply leave that section out.

Formal lab reports should always be word-processed or at least written neatly in ink. Never write any section in pencil. Graphs should be hand drawn or done by a computer-graphing program. The report does not necessarily have to be lengthy or elaborate. Scientific writing should be clear, concise and accurate. Correct spelling and grammar is always important and will have an impact on the evaluation of your report. Unless your teacher informs you that this will be a group report, each student in the lab group will be responsible for completing his/her own report. The report may include:

Title Page	This section includes your name, title of the lab and the names of all lab partners. The page should also include the course title, instructor, period and the date the lab was conducted
Title	The title of the report must clearly reflect what the experiment was all about. This is not an appropriate place for creative or ambiguous titles.
Purpose	This section of the report clearly states in one or two sentences what is to be studied in this experiment. What are you trying to find out in this experiment?
Hypothesis	Write a brief statement outlining your specific expected outcomes of the experiment. The hypothesis is what you think will happen during the experiment. It differs from a guess in that it is based upon prior knowledge or evidence.
Materials	List what equipment was used in your experimental setup. In many

	experiments, it may be helpful to include a detailed and labeled diagram of how the equipment is set up. Experiments involving measurements of electrical circuits must include a circuit diagram.
Procedure	If you are reporting on an experiment with a written procedure, summarize briefly how the experiment was performed. Include only the basic elements the will give the reader an understanding of how the data was collected. Please do not include small details such as size of beakers, specific times, computer commands, or how specific equipment is to be connected together, etc. Do NOT just recopy the procedure from the lab book or hand out. Write the procedure as if you were describing the experiment to an interested friend. If you are writing a report on an experiment of your own design, list the numbered steps of the procedure you followed. This should look a lot like the procedure section of your lab book
Safety	Write a short statement outlining whatever safety precautions might apply to the experiment. Consider the potential dangers of flammables, corrosives, toxins, sharps, heat or cold, among others. Eye protection is required for experiments involving the use of chemicals, boiling water, dissections or the possibility of flying projectiles
Experimental Data	This section of the report will contain the raw data collected during the experiment. Experimental data may take the form of **qualitative observations** made during the experiment. Observations may include color changes, new products formed, phase changes, sounds, lights, positions or other non-measurement observations. This type of information is often best given in paragraph form where you describe your observations during a particular step. Include in your description what you did and what happened when you did it. Do not attempt to include interpretations of what happened at this time. This section is for raw data only. Data may also take the form of numerical measurements collected during the experiment. **Quantitative Data** should be included in a data table with clearly labeled headings that include the units used. Do not ignore suspected faulty data but include it you report. Later, in your CONCLUSIONS, you will have the opportunity to explain why you have decided not to include the suspected errors in your analysis.
Charts and Graphs	To look for relationships in the data it is often of benefit to graph the data collected. Make sure all graphs and charts are fully titled and labeled. See handout on how to construct a scientific graph for format instructions.
Sample Calculations	Every time that you perform a new calculation for data analysis, show a sample calculation of how it was done in this section of your report. Show a sample for each type of calculation done in the experiment, no matter how trivial it seems. Use data from your experiment in your sample calculation, not made up numbers. Fully label each calculation so that the reader understands what you are calculating. Show the equation used for each calculation. Make sure that each measurement has the proper units and that each calculated result is given the correct number of significant digits. If a

	calculation is repeated in the experiment, there is no need to show it more that once. %Error: calculation which determines how close your experimental value is to the accepted value (as always, show your work) $\% \text{ Error} = \frac{\lvert \text{accepted value - your value} \rvert}{\text{accepted value}}$ If one of the analysis questions below asks for a calculation, show the work in the Questions section not Sample Calculations.
Questions	All analysis questions found at the end of the experiment are to be answered in **complete sentences** (except calculations, where you need to show your work). One or two word answers are never acceptable. Do not rewrite the original question; instead, word your answer such that the question is obvious from the wording of your answer.
Conclusions	This is the most important part of your lab report. It is here that you answer the questions asked in the purpose. Your conclusion should always be stated in terms of what you said your purpose was. Did the experiment verify your hypothesis? How do you know? Begin your conclusion by restating your purpose and/or hypothesis. In a sentence or two, indicate how the experiment was conducted. State whether the results verified or refuted your hypothesis. List the evidence or logic from your experimental results that lead you to that conclusion. Be specific. If your results did not agree with the expected results, how far off were you from the accepted value? A percent error might be appropriate here. Is this error significant? Looking back on how the experiment was conducted, identify several sources of error. "Experimental error", "measurement error", "human error" and "calculation error" are not acceptable statements of error. Be much more specific! Your discussion of error should include the effects of each source with regard to both magnitude and direction. If you were to do this experiment again, how could you modify this experiment to improve your results? Many of the points made above may have been previously discussed elsewhere in the report. **Do not leave them out of your conclusion!** Your conclusion should be able to stand alone without the rest of the report.

All reports should be signed and dated by the author at the bottom of the report. The date should reflect the date that the report is submitted.