

**BERNARDS TOWNSHIP PUBLIC SCHOOLS  
BASKING RIDGE, NEW JERSEY**

**AP ENVIRONMENTAL SCIENCE**

**Grade 11, 12**

REVISION:  
Summer 2007

Supervisor:  
Brian Heineman

Revision Committee:  
Dan Friedman

Approved by the Bernards Township Board of Education  
October 22, 2007

Bernards Township Public Schools  
Basking Ridge, New Jersey

Board of Education

William Koch, President  
Lisa Winter, Vice President  
Michael J. Byrne  
Louis Carlucci  
Susan McGowan  
Janet Smith  
Leslie Stevens  
Susan Cauldwell Carlsson  
Ann Marie Woolford

Administration

Valerie A. Goger  
Superintendent of Schools

Regina Rudolph  
Assistant Superintendent

Sean Siet  
Director of Curriculum and Instruction

Affirmative Action Officer

Regina Rudolph, Assistant Superintendent

504 Coordinator

Monica Butler, Director of Special Services

*This document has been aligned with the  
New Jersey Core Curriculum Content Standards*

*It is the policy of the Bernards Township Board of Education to provide equal  
education opportunities regardless of color, creed, religion, gender or handicap.*

2007/2008

## **PHILOSOPHY OF SCIENCE EDUCATION**

### Kindergarten through Grade Twelve

Education in science introduces students to the community of scientists, to the traditions of science, and to scientific activity. Through the experiences provided in learning science, students become acquainted with the process by which scientific concepts are created and then explored. Knowledge of the processes and concepts leads to the awareness that science is not a set of findings but rather the search for them. This awareness is accompanied by the understanding that the issues created by the advance of science can only be resolved by moral judgment and political choice.

Science education addresses the need of students to deal with science as part of our culture. For some students, the experiences of science education initiate or respond to a personal interest in preparing to enter those courses of study and training that lead to participation in the democratic community of pure and applied scientists. In addition, science education prepares all students to respond to scientific information regarding the social and personal issues raised by technology.

Students learn science best when they have opportunities to model the methods of science, to learn science by doing science. This complements students' development as they move from dependence on concrete activities to tentative experiences with abstract thinking. At all grade levels, students' innate curiosity deserves stimulation and guidance.

The content of science education is selected to meet students' needs. The content provides for the development of science concepts that are encountered and explored using the processes of science. There are opportunities for independent critical thinking. These encourage a healthy skepticism.

Students learning science collect real data in classrooms, laboratories, and the out-of-doors. They record observations and measurements done at large and small scales, in qualitative and quantitative modes. They manipulate apparatus and follow directions to assemble and disassemble it. They analyze data, manipulate it, graph it. They use mathematics to find patterns, discover relationships, and generate explanations. They employ quick mental estimates for many mathematical operations.

The outcomes of science education are recognized when students...

- demonstrate the knowledge and use the processes of science
- demonstrate knowledge of and appreciation for the nature of science
- apply knowledge in the science disciplines
- demonstrate skills for applying the processes, the knowledge, and the appreciation of science to issues wherein science, technology, and society meet.

The student who has achieved mastery in science education has experienced, can describe, and can choose to use the directing purpose of science: to explore the truth.

Rev. 9/97

## **HOW THIS GUIDE SHOULD BE USED**

The following guide should be used in conjunction with the textbook in instructional planning. The guide, in contrast to the textbook, is skill driven. The objectives are designed to reflect the skills, behaviors, and proficiencies necessary for mastery of the course content. Lesson planning must therefore incorporate content and objectives.

Activities contained in the guide are suggested and can be added to or altered. This guide must also be used in conjunction with the **NEW JERSEY CORE CURRICULUM CONTENT STANDARDS** and choice of activities must be in keeping with these **STANDARDS**.

Evaluations of the various objectives are to be done according to the **EVALUATION TOOLS** suggested. (See Appendix 1)

The Primary reference textbook for AP Environmental Science is:

Miller, G. Tyler Jr., *Living In The Environment 13<sup>th</sup> Edition*  
Thompson Brooks/Cole: 2004

## COURSE DESCRIPTION

### ADVANCED PLACEMENT ENVIRONMENTAL SCIENCE

**FULL YEAR  
7 CREDITS  
AP**

**Prerequisite:** Advanced Placement Physics I, College Preparatory Physics (M), or concurrent enrollment.

Advanced Placement Environmental Science is an intensive approach to the study of the Earth's biological and chemical systems and how they interact to provide an inhabitable environment for the myriad living organisms on this planet. Fundamental skills emphasized are experimental design and execution, analyzing and modeling data, using technology to gather, organize, and analyze data and critical data interpretation.

The course includes a laboratory and/or field investigation component. A minimum of two class periods or the equivalent per week is spent engaged in laboratory and/or field work.

Successful students are prepared for and are expected to take the Advanced Placement test in Environmental Science.

<b>NJ STD</b>	<b>CONTENT</b>	<b>OBJECTIVE</b>	<b>TEXT</b>	<b>ACTIVITY</b>	<b>EVAL</b>
5.10.12 1,2,3	Chapter 1  Environ-mental Science and Sustainability	1.1 Define Environmentalism  1.2 The Global Environmental Picture 1.3 Sustainable Development	pp 2-  -pp 15	LB: (E&S) Exercise 2-Scientific Meas. Pg 7. Questions – Miller p.18-19	3  6.1
5.10.12 7,10	Chapter 4 Ecosystems:  Units of Stability	4.1 Define an Ecosystem 4.2 Structure of Ecosystems  4.3 Factors Defining ecosystems 4.4 Human role in Ecosystems	pp 64-  -pp 76	Debate – Pg 19 Miller #1 LB: Investigation of Pond (fresh H2O)  Notes	9 4, 6
5.10.12 7,10	Chapter 3 Ecosystems: How They Work	3.1 Elements of Life, Organization and Energy 3.2 Principles of Ecosystem Function 3.3 Implications for Humans	pp 47-55  pp 74-80	LB: Exer #4 (E&S) Atoms and Molec. Notes	2.2, 6
5.10.12- 7,10	Chapter 9 Ecosystems In and Out of Balance	9.1 Ecosystem Balance is Population Balance 9.2 Mechanisms of Population Balance 9.3 Two Kinds of Population Growth Curves 9.4 Ecological Succession 9.5 The Fourth Principle of Ecosystem Sustainability 9.6 Implications for Humans	pp 191-  -pp 200	LB: Ecosystem Study – Build Ecosystems (Aquatic and Terrestrial) for study over course of several weeks. LB: (E&S) Exer. #1 Interrelationships Simulation, Pg 3. Notes	1, 5, 8,11  4
5.10.12- 7,10	Chapter 5 Ecosystems: Adapting to Change	5.1 Selection by the Environment 5.2 Selection of Traits and Genes 5.3 Changes in Species and Ecosystems 5.4 Global Changes	pp 101-  -pp 107	LB: Field Trip-Ecosystem Study Local County Env. Educ. Center Notes	8
5.10.12 2,9	Chap 12 The Global Human Population Explosion:	12.1 The Population Explosion and Its Cause 12.2 Different Worlds 12.3 Environmental and Social Impacts of Growing Populations	pp 254-	LB: (E&S) Exer. 17 Human Pop.Changes in Survival, Pg 87. LB: (E&S) Exer. 18 Population Demographics, Pg.93	2,5,7  5, 9

NJ STD	CONTENT	OBJECTIVE	TEXT	ACTIVITY	EVAL
	Causes and Consequences	12.4 Dynamics of Population Growth		LB: (Carolina Biol.Supply): Pop. Growth In <i>Lemna minor</i> Notes	4
5.10.12- 2,9	Chap 12 Addressing the Population Problem	12.5 Population and Development 12.6 Reassessing the Demographic Transition 12.7 A New Direction for Development  12.8 Thailand's Growth	-pp 274	LB: Population and Environ. Exercise. (Miller) Pg 202, Prob.#10 Debate – Five Principles of Sustainability Notes	1, 3  9
5.10.12- 6,9	Chap 13-The Production and  Distribution of Food	13.1 Crops and Animals: Major Patterns of Food Production  13.2 Food Distribution and Trade 13.3 Hunger, Malnutrition, and Famine 13.4 Building Sustainability Into the Food Arena 13.5 Genetic Engineering	pp 277-       -pp 308	LB: Internet Activity – Determination of Production.  Group Projects: What Did I Just Eat? Notes	2,11  9, 11

<b>NJ STD</b>	<b>CONTENT</b>	<b>OBJECTIVE</b>	<b>TEXT</b>	<b>ACTIVITY</b>	<b>EVAL</b>
5.10.12-9	Chap 10-Soil and the Soil Ecosystem	10.1 Plants and Soil 10.2 Losing Ground: Soil Erosion 10.3 Geologic Processes 10.4: The Rock Cycle	pp 203-  -pp 226	LB: Soil Profile and Analysis Laboratory LB: Soil Conservation Display Projects LB: (E&S) Exer.8 Soil Charact. and Plant Growth, Pg.43	2.1, 3, 5 11 4 2.1
5.10.12-7	Chap 20-Pests and Pest Control	20.1 The Need for Pest Control 20.2 Promises and Problems of the Chemical Approach 20.3 Alternative Pest Control Methods 20.4 Socioeconomic Issues In Pest Management 20.5 Public Policy	pp 512-  -pp 523	LB: Natural Selection Exercise as a Model for Pest Control Management Notes	1,3,4, 5

<b>NJ STD</b>	<b>CONTENT</b>	<b>OBJECTIVE</b>	<b>TEXT</b>	<b>ACTIVITY</b>	<b>EVAL</b>
5.10.12-3,10	Chap 4, 14 Water, the Water Cycle, and Water Management	14.1 The Water Cycle 14.2 Human Impacts on the Water Cycle 14.3 Sources and Uses of Fresh Water 14.4 Overdrawing Water Resources 14.5 Obtaining More Water 14.6 Using Less Water 14.7 Desalting Sea Water 14.8 Storm Water Mismanagement and Management	pp 312-       -pp 335	LB: Field Trip—Water Purification Plant LB: Water Analysis for the Presence of Nutrients	8  5, 7  2.1
5.10.12-1,8	Chap 7- Sediments, Nutrients and Eutrophication	7.1 The Process of Eutrophication 7.2 Combating the Symptoms of Eutrophication 7.3 Long-term Strategies for Correction 7.4 Salt Water Life Zones	pp 144-   -pp 162	LB: Simulation of Eutrophication	5, 11  2.1
5.10.12	Chap 19-Water Pollution	19.1 Sources of Water Pollution 19.2 Sewage Management and Treatment 19.3 Impediments to Recycling Sewage Products 19.4 Ocean Pollution	pp 483-  -pp 508	LB: Field trip to Sewage Processing Plant LB: (ESFL) Computer Simulation – Stream Pollution	2.2, 8  6

<b>NJ STD</b>	<b>CONTENT</b>	<b>OBJECTIVE</b>	<b>TEXT</b>	<b>ACTIVITY</b>	<b>EVAL</b>
5.10.12-1,6	Chap 21- Pollution From Solid And Hazardous Waste	21.1 The Nature of Chemical Risks: HAZMATS 21.2 A History of Mismanagement 21.3 Cleaning Up the Mess 21.4 The Solid Waste Problem 21.5 Management of New Wastes: lead, dioxins, chlorine, mercury 21.6 Looking Toward the Future: Pollution Avoidance – Producing Less Waste	pp 525-  -pp 555	LB: (E&S) Exer. 28 – Toxicity Testing, LB: “What If” Scenario: What If There Were No Fungi Or Bacteria? Case Study (Miller) pg.525: “There Is No Away: Love Canal” Field Trip: County Recycling Facility	2, 8  2  6  1, 8
5.10.12-5,10	Chap 17-Air Pollution And Its Control	17.1 Atmospheric and Air Pollution Essentials 17.2 Major Air Pollutants and Their Impact 17.3 Pollutant Sources 17.4 Photochemical and Industrial Smog 17.5 Acid Deposition 17.6 Bring Air Pollution Under Control 17.7 Indoor Air Pollution 17.8 Effects of Air Pollution On Living Organisms and Materials 17.9 Taking Stock	pp 418-  -pp 444	LB: Internet Exercise in Acquiring, Plotting and Analysis of Pollution Data LB: Construct Models of Electrostatic Precipitator Baghouse Filter Cyclone Separator Wet Scrubber	1,5,7,9  6, 11  2.1
5.10.12-5,10	Chap 18-Major Atmospheric	18.1 Greenhouse Effect and Global Warming 18.2 News From Antarctica and Greenland	pp 446-	LB: Internet Exercise: Modeling Estimated Changes in Average Global Atmospheric Temperatures	5,7,9

<b>NJ STD</b>	<b>CONTENT</b>	<b>OBJECTIVE</b>	<b>TEXT</b>	<b>ACTIVITY</b>	<b>EVAL</b>
	Changes	18.3 Depletion of the Ozone Shield 18.4 The Kyoto Treaty 18.5 Sun Exposure and Skin Cancer	-pp 479		
5.10.12-  5,10	Chap 27  Pollution And Public Policy  Chap 11	27.1 Origins of Environmental Public Policy  27.2 Economic Effects of Environmental Public Policy 27.3 Implementing Environmental Public Policy 27.4 Important Environmental Legislation: A Chronology 27.5 Cost-Benefit Analysis 27.6 Risk Analysis	pp 716-  -pp 738  pp 229- -pp 249	LB: Case Study: Environmental Policy in the United States (Miller p.719)	9
5.10.12-  7,10	Chap 22-Wild Species: Biodiversity And Protection	22.1 Saving Wild Species: Conservation and Preservation 22.2 Biodiversity 22.3 Species Extinction 22.4 Biological Systems in a Global Perspective	pp 560-    -pp 590	Debate (Goldfarb) Should the Endangered Species Act ..? LB: Simulation of ‘Cataclysm’ And Organismic Response	6.1  4

<b>NJ STD</b>	<b>CONTENT</b>	<b>OBJECTIVE</b>	<b>TEXT</b>	<b>ACTIVITY</b>	<b>EVAL</b>
5.12- 5,10	Chap 15 – Energy Resources: The Rise and Fall Of Fossil Fuels	15.1 Energy Sources and Uses 15.2 Declining Reserves of Crude Oil 15.3 Coal 15.4 Natural Gas 15.5 Sustainable Energy Options	pp 338-  -pp 364	LB: Power Plant Design	3, 11
5.12 5,10	Chap 15 Nuclear Energy	15.6 Nuclear Power: Dream or Delusion 15.7 How Nuclear Power Works 15.8 Radioactive Materials and Their Hazards 15.9 More Advanced Reactors 15.10 The Future of Nuclear Power	pp 365-  -pp 367	LB: Analysis of CO <sub>2</sub> Trends LB: (ESFL) Computer Simulation -Radiation in the Environment.	2,10 2.1 6
5.12 7,10	Chap 16-Solar And Other Renewable Energy Resources	16.1 Principles of Solar Energy 16.2 Putting Solar Energy to Work 16.3 Producing Electricity From Wind 16.4 Producing Electricity From Biomass 16.5 The Solar-Hydrogen Revolution 16.6 Geothermal Energy 16.7 Hydropower plants 16.8 Improving Energy Efficiency: Hybrid Cars 16.9 Improving Energy Efficiency at Home And At Businesses 16.10 Policy for a Sustainable Energy Future	pp 380-  -pp 414	LB: Electric Car demonstration.	6 2.1

<b>NJ STD</b>	<b>CONTENT</b>	<b>OBJECTIVE</b>	<b>TEXT</b>	<b>ACTIVITY</b>	<b>EVAL</b>
5.12 7,10	Chap 25 Sustainable Cities: Urban Land Use And Management	25.1 From Urban Structure to Urban Sprawl 25.2 Social Consequences of Exurban Migration 25.3 Moving Toward Sustainable Cities 25.4 Jobs And The Environment	pp 660-  -pp 686	Discussion: Case Study- Mexico City (Miller p.662)	9

All EXERCISE numbers refer to those from the laboratory manual ENVIRONMENTAL SCIENCE – Field and Laboratory Activities (5<sup>th</sup> Ed.) by Eldon D. Enger and Bradley F. Smith, Wm C. Brown Publishers.

Debate information resources – Primary 1. TAKING SIDES by Theodore D. Goldfarb, 6<sup>th</sup> Ed. The Duskin Publishing Group, Inc.

## **APPENDIX 1: EVALUATION TOOLS**

The numbers in the evaluation column refer to the items listed below. These tools and instruments are used to evaluate student mastery of the identified skills.

1. Quiz
  - 2. Tests
  - 2.1 Book test, published
  - 2.2 Teacher's test
2. Essay
3. Checklist based on skills
4. Lab report
  - 6.0 Homework
  - 6.1 Book/published
  - 6.2 Teacher created
5. Graph data
6. Demonstration/guided observation
7. Chart or table
8. Notebook check
9. Group discussion
10. VCR observation with guide questions
11. Speech or presentation