2015/2016

Curriculum Guide:

Environmental Science

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[redacted]

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Course Description and Curriculum Guide

Environmental Science

Course Description:

Environmental Science is one credit, year-long, laboratory-based science class that fulfills the graduation requirement for a laboratory science course at [redacted].
The environmental science course is designed to empower students with the necessary knowledge and skills that will enable them to apply scientific skills and processes to major environmental science concepts. Upon successful completion of this course, students should be able to use the scientific skills and processes and major environmental science concepts to understand interrelationships of the natural world and to analyze environmental issues and their solutions.

This course surveys key topic areas including the application of scientific process to environmental analysis; ecology; energy flow; ecological structures; earth systems; and atmospheric, land, and water science. Topics also include the management of natural resources and analysis of private and governmental decisions involving the environment. Students explore actual case studies and conduct five hands-on, unit-long research activities, learning that political and private decisions about the environment and the use of resources require accurate application of scientific processes, including proper data collection and responsible conclusions.

Primary Text:

Arms, K. (2008). *Environmental Science.* Austin, TX: Holt Rinehart & Winston Publishers.

Time Allotment: 53 minutes per day, 5 days per week

Pre-requisite: None

Grades: 10/11/12

Year at a Glance

	Topic	Activities	Assessments
August	Introduction to Environmental Science	Debate on Christian Role in Environmental Protection	Reflection paper: A Christian View of the Environment Critique of a mock scientific experiment report
September	The Earth as System Scientific Processes	Learning how to use Case Studies Joining a Global Data Collection Project on Environmental Concerns	Multiple choice test- terms and concepts in ecology
Mid-September- mid October	Ecosystems and Biomes Students choose Independent Research Project topic	Inquiry lab "How do Brine Shrimp Select a Habitat?" Lab: Eutrophication: Too Much of A Good thing? Lab- dissecting owl pellets Lab- Studying Population Growth	
Mid-October-December	Natural Resources	Field Study: Water Resources Visit to Azraq wetlands to learn about a Jordanian case study in ecosystem change Field Study- water quality in Jordanian streams Lab- Extraction of Copper from Its Ore Lab- water filtering	**interpretation of a case study**
January- mid March	Environmental Concerns	Field trip to Shomari Wildlife Preserve- case study of biodiversity and extinction Lab The Acid Test Air quality study Lab- Solid Wastes in Your Lunch Field Study: Pollution Lab- Lead Poisoning and Mental Ability	Independent Research Project Presentation Students write an article for publication about a Jordanian environmental concern
Mid-March-May	Politics and the Environment	Visit to RSCN to hear about how environmental law is passed in Jordan and what areas are of major concern here Plan and carry out Earth Day Activities for the entire school	Students write a proposal for a law protecting the environment

<table>
<tr><th colspan="2">Unit 1: The Nature of the Environment: Establishing a Christian World View</th></tr>
<tr><td>Time frame: 3 weeks</td><td>Text Section: Chapters 1,2, 3</td></tr>
<tr><td colspan="2">Essential Questions: What is Environmental Science? Why should we care? How do environmental scientists collect data?</td></tr>
<tr><td>Unit Content:

• Introduction to Environmental Science
• Case Study: Easter Island
• Environment and Society
• Science of Environmental Science
• Earth as an Environmental System
• Scientific Processes and Decision Making
• Questioning and Hypothesizing
• Collecting Environment Data
• Field Study: Remote Sensing
• Analysing Data
• Using the Metric System Effectively
• Communicating</td><td rowspan="2">Objectives: Students will…
• Consider the Christian stances on environmental issues from a variety of perspectives
• Discover how scientific processes are applied in various scenarios involving the environment.
• Learn that questioning, hypothesizing, experimenting, analyzing data, concluding, and communicating are processes that must be carried out accurately if data about the environment is to be valid.
• Conduct a lab, applying scientific processes to a focused study.
• Learn how to understand and discuss a case study</td></tr>
<tr><td>Standards:
12ASI2.1
12ASI2.2
12ASI2.3</td></tr>
<tr><td>Biblical Integration:

Discussion of Dr. Lytton Musselman’s lecture

Caring for Creation

A Biblical View on Christian Environmental Concern</td><td>Hands-on Activities:
• Skills Practice Lab Observation lab- relationship between temperature and fermentation by yeast
• Students join in a global data collection/earth watch project http://www.globe.gov/do-globe/measurement-campaigns</td></tr>
<tr><td>TCK Standards:</td><td>Assessment: Reflection paper: A Christian View of the Environment
Critique of a mock scientific experiment report</td></tr>
<tr><td>Technology Integration:
• Students will use remote sensing sites to observe a natural environment to determine its health and potential threats to it</td><td>Additional Resources:
http://ww2.odu.edu/~lmusselm/essays/ABiblicalViewofCreation.htm
http://populationsvsresources.weebly.com/case-study-easter-island.html
http://www.greenpeace.org/international/en/campaigns/detox/water/Hidden-Consequences/
https://nsidc.org/cryosphere/seaice/study/r</td></tr>
</table>

	emote_sensing.html remote sensing http://www.globe.gov/ join a remote sensing project going on currently

Unit 2 : Fundamentals of Ecology	
Time frame: 6 weeks	**Text Section:** Chapters 3,4,5,6,7, 8, 9
Essential Questions: How are earth's systems connected?	
Unit Content: • Earth Systems and Lithosphere • Atmosphere • Hydrosphere and Biosphere • Case Study: Hurricane • Individuals and Populations • Ecosystems and Biomes • Field Study: Ecosystems • Energy Flow in Ecosystems • Nutrient Cycling in Ecosystems • Case Study: How Ecosystems Change • Case Study: Population Growth • Principles of Population Growth	**Objectives:** Students will… • Survey the basics of the science of ecology including the organization of Earth's "spheres" and the structure of ecosystems. • Learn how energy enters and flows through ecosystems and how this interacts with various biogeochemical cycles. • Become familiar with three case studies involving systems and engage in a field study in the description of ecosystems. • Learn how good science and accurate data are fundamental to making decisions about the health of ecosystems. • Identify Biomes of Jordan
Standards: 12FSPSP4.1 12FSPSP4.2 12FSPSP5.1 12FSPSP5.2 12FSPSP5.3	
Biblical Integration:	**Hands-on Activities:** • Inquiry lab "How do Brine Shrimp Select a Habitat?" • Lab: Eutrophication: Too Much of A Good thing? • Lab- dissecting owl pellets • Lab- Studying Population Growth
TCK Standards:	**Assessment: Multiple choice test- terms and concepts in ecology**
Technology Integration: •	**Additional Resources:** • http://www.bbc.co.uk/schools/gcsebitesize/geography/natural_hazards/hurricanes_rev3.shtml case study hurricanes • http://www.hurricanescience.org/history/studies/

	case study • http://unu.edu/publications/articles/ecosystem-change-and-human-well-being-cases-from-indonesia-china-and-japan.html ecosystem change

Unit 3: Resources	
Time frame: 6 weeks	**Text Section:** Chapters 7, 14-18
Essential Questions:	**How does Human Endeavor Impact the Environment?**
Unit Content: • Classification of Resources • Case Study: Soil • Soil as a Resource • Case Study: Water • Water as a Resource • Case Study: Fish • Case Study- Effects of Mining • Food as a Resource • Fossil Fuels: Types • Fossil Fuels: Current Issues • Renewable energy **Standards:** 12FSPSP6.4 12FSPSP6.5	**Objectives:** Students will… • Learn about renewable, nonrenewable, and perennial resources through case studies. • Examine soil, water, timber, and mineral resource issues • Conduct a field study on water resources. • Study fossil fuels as the basis for understanding issues of global climate and pollution. • learn about different methods of generating electricity, including alternative methods that use renewable energy sources and pollute the environment less. • Learn ways to reduce electricity consumption. • Write reports contrasting different methods of electrical power generation, such as hydroelectric and nuclear. • Conduct an electrical audit on a home and make proposals on the most efficient way to insulate a home. • Create a mock interview with a participant in the World Solar Challenge. •
Biblical Integration:	**Hands-on Activities:** • Field Study: Water Resources Visit to Azraq wetlands to learn about a Jordanian case study in ecosystem change • Field Study- water quality in Jordanian streams • Lab- Extraction of Copper from Its Ore • Lab- water filtering
TCK Standards:	**Assessment: interpretation of a case study**

Technology Integration:	Additional Resources:
•	• http://www.bothends.org/uploaded_files/uploadlibraryitem/1case_study_South_Africa_updated case study, effects of mining

Unit 4: Environmental Concerns	
Time frame: 3 weeks	**Text Section:** Chapters 10,19,12, 13
Essential Questions:	**How Can Humans Restore Broken Environments?**
Unit Content: • Modern Environmental Concerns • Case Study: Air Pollution • Air Pollution: Science and Solutions • Case Study: Acid Rain • Acid Rain: Science and Solutions • Hazardous and Solid Waste: Science and Solutions • Case Study: Biodiversity and Extinction • Biodiversity and Extinction • Global Climate Concerns	**Objectives:** Students will… • Explore some modern issues involving the environment through case studies. • Examine issues in pollution, waste, biodiversity, extinction, and the global climate. • Learn about the sources and health effects of indoor and outdoor air pollution, heavy-metal pollution, and water pollution • Learn about new technologies that lessen dangers to the environment.
Standards: 12FSPSP4.1 12FSPSP4.2 12FSPSP5.1 12FSPSP5.2 12FSPSP5.3 12FSPSP6.4 12FSPSP6.5	
Biblical Integration:	**Hands-on Activities:** • Field trip to Shomari Wildlife Preserve- case study of biodiversity and extinction • Lab The Acid Test • Air quality study • Lab- Solid Wastes in Your Lunch

	• Field Study: Pollution • Lab- Lead Poisoning and Mental Ability
TCK Standards:	**Assessment: Students write and publish an article about the efforts of Shomari Nature Reserve to restore species**
Technology Integration: •	**Additional Resources:** • http://www.theicct.org/sites/default/files/MRay_0.pdf case study air pollution • http://www.lordgrey.org.uk/~f014/usefulresources/aric/Resources/Teaching_Packs/Key_Stage_4/Acid_Rain/03.html case study acid rain

Unit 5: Politics, Laws, and the Environment	
Time frame: 3 weeks	**Text Section:** Chapter 20,21
Essential Questions:	**What is Government's Role in Monitoring the Environment?**
Unit Content: • Government and the Environment • Case Study: Passing an Environmental Law • Clean Air Legislation • Clean Water Legislation • Other Types of Environmental Legislation	**Objectives:** Students will… • Review the structure of government and the process of passing laws in Jordan and countries representing the students' passport culture. • Examine four major international laws currently affecting the health of the environment and the current state of politics regarding the global environment.
Standards: 12FSPSP6.1 12FSPSP6.2 12FSPSP6.4 12FSPSP6.3	
Biblical Integration:	**Hands-on Activities:** • Visit to RSCN to hear about how environmental law is passed in Jordan and what areas are of major concern here

TCK Standards:	**Assessment: students write a proposal for an environmental law**
Technology Integration: •	**Additional Resources:** • http://www.environmentlaw.org.uk/rte.asp?id=228 case study, passing an environmental law

Unit 6: Individual Research Project (IRP)	
Time frame: 4 weeks	**Text Section:**
Essential Questions:	
Unit Content: •	**Objectives:** Students will… • Identify questions and concepts that guide scientific investigations. • Demonstrate appropriate procedures, a knowledge base, and conceptual understanding of scientific investigations. • form a testable hypothesis and demonstrate the logical connections between the scientific concepts guiding a hypothesis and the design of an experiment. • Design and conduct scientific investigations • Use technology and mathematics to improve investigations and communications. • Communicate and defend a scientific argument • Formulate and revise scientific explanations and models using logic and evidence. • Recognize and analyze alternative explanations and models.
Standards: 12ASI1.1 12ASI1.2. 12ASI1.3 12ASI1.4 12ASI1.5 12ASI1.6.12ASI2.1 12ASI2.2 12ASI2.3 12ASI2.4 12ASI2.5 12ASI2.6.12EST1.1 12EST1.2 12EST1.3 12EST1.4 12EST1.5	
Biblical Integration:	**Hands-on Activities:** •
TCK Standards:	**Assessment:**
Technology Integration: •	**Additional Resources:** •

Appendices

[redacted] Science Standards for Environmental Science

Abilities necessary to do scientific inquiry

12ASI1.1 Identify questions and concepts that guide scientific investigations. Students should form a testable hypothesis and demonstrate the logical connections between the scientific concepts guiding a hypothesis and the design of an experiment. They should demonstrate appropriate procedures, a knowledge base, and conceptual understanding of scientific investigations.

12ASI1.2 Design and conduct scientific investigations. Designing and conducting a scientific investigation requires introduction to the major concepts in the area being investigated, proper equipment, safety precautions, assistance with methodological problems, recommendations for use of technologies, clarification of ideas that guide the inquiry, and scientific knowledge obtained from sources other than the actual investigation. The investigation may also require student clarification of the question, method, controls, and variables; student organization and display of data; student revision of methods and explanations; and a public presentation of the results with a critical response from peers. Regardless of the scientific investigation performed, students must use evidence, apply logic, and construct an argument for their proposed explanations.

12ASI1.3 Use technology and mathematics to improve investigations and communications. A variety of technologies, such as hand tools, measuring instruments, and calculators, should be an integral component of scientific investigations. The use of computers for the collection, analysis, and display of data is also a part of this standard. Mathematics plays an essential role in all aspects of an inquiry. For example, measurement is used for posing questions, formulas are used for developing explanations, and charts and graphs are used for communicating results.

12ASI1.4 Formulate and revise scientific explanations and models using logic and evidence. Student inquiries should culminate in formulating an explanation or model. Models should be physical, conceptual, and mathematical. In the process of answering the questions, the students should engage in discussions and arguments that result in the revision of their explanations. These discussions should be based on scientific knowledge, the use of logic, and evidence from their investigation.

12ASI1.5 Recognize and analyze alternative explanations and models. This aspect of the standard emphasizes the critical abilities of analyzing an argument by reviewing current scientific understanding, weighing the evidence, and examining the logic so as to decide which explanations and models are best. In other words, although there may be several plausible explanations, they do not all have equal weight. Students should be able to use scientific criteria to find the preferred explanations.

12ASI1.6 Communicate and defend a scientific argument. Students in school science programs should develop the abilities associated with accurate and effective communication. These include writing and following procedures, expressing concepts, reviewing information, summarizing data, using language appropriately, developing diagrams and charts, explaining statistical analysis, speaking clearly and logically, constructing a reasoned argument, and responding appropriately to critical comments.

Understandings about scientific inquiry

12ASI2.1 Scientists usually inquire about how physical, living, or designed systems function. Conceptual principles and knowledge guide scientific inquiries. Historical and current scientific knowledge influence the design and interpretation of investigations and the evaluation of proposed explanations made by other scientists.

12ASI2.2 Scientists conduct investigations for a wide variety of reasons. For example, they may wish to discover new aspects of the natural world, explain recently observed phenomena, or test the conclusions of prior investigations or the predictions of current theories.

12ASI2.3 Scientists rely on technology to enhance the gathering and manipulation of data. New techniques and tools provide new evidence to guide inquiry and new methods to gather data, thereby contributing to the advance of science. The accuracy and precision of the data, and therefore the quality of the exploration, depends on the technology used.

12ASI2.4 Mathematics is essential in scientific inquiry. Mathematical tools and models guide and improve the posing of questions, gathering data, constructing explanations and communicating results

12ASI2.5 Scientific explanation must adhere to criteria such as: a proposed explanation must be logically consistent; it must abide by the rules of evidence; it must be open to questions and possible modification; and it must be based on historical and current scientific knowledge.

12ASI2.6 Results of scientific inquiry — new knowledge and methods — emerge from different types of investigations and public communication among scientists. In communicating and defending the results of scientific inquiry, arguments must be logical and demonstrate connections between natural phenomena, investigations, and the historical body of scientific knowledge. In addition, the methods and procedures that scientists used to obtain evidence must be clearly reported to enhance opportunities for further investigation.

Science and Technology (12EST)

Abilities of technological design

12EST1.1 Identify a problem or design an opportunity. Students should be able to identify new problems or needs and to change and improve current technological designs.

12EST1.2 Propose designs and choose between alternative solutions. Students should demonstrate thoughtful planning for a piece of technology or technique. Students should be introduced to the roles of models and simulations in these processes.

12EST1.3 Implement a proposed solution. A variety of skills can be needed in proposing a solution depending on the type of technology that is involved. The construction of artifacts can require the skills of cutting, shaping, treating, and joining common materials - such as wood, metal, plastics, and textiles. Solutions can also be implemented using computer software.

12EST1.4 Evaluate the solution and its consequences. Students should test any solution against the needs and criteria it was designed to meet. At this stage, new criteria not originally considered may be reviewed.

12EST1.5 Communicate the problem, process, and solution. Students should present their results to students, teachers, and others in a variety of ways, such as orally, in writing, and in other forms - including models, diagrams, and demonstrations.

Understandings about science and technology

12EST2.1 Scientists in different disciplines ask different questions, use different methods of investigation, and accept different types of evidence to support their explanations. Many scientific investigations require the contributions of individuals from different disciplines, including engineering. New disciplines of science, such as geophysics and biochemistry often emerge at the interface of two older disciplines.

12EST2.2 Science often advances with the introduction of new technologies. Solving technological problems often results in new scientific knowledge. New technologies often extend the current levels of scientific understanding and introduce new areas of research.

12EST2.3 Creativity, imagination, and a good knowledge base are all required in the work of science and engineering.

12EST2.4 Science and technology are pursued for different purposes. Scientific inquiry is driven by the desire to understand the natural world, and technological design is driven by the need to meet human needs and solve human problems. Technology, by its nature, has a more direct effect on society than science because its purpose is to solve human problems, help humans adapt, and fulfill human inspirations. Technological solutions may create new problems. Science, by its nature, answers questions that may or may not directly influence humans. Sometimes scientific advances challenge people’s beliefs and practical explanations concerning various aspects of the world.

12EST2.5 Technological knowledge is often not made public because of patents and the financial potential of the idea or invention. Scientific knowledge is made public through presentations at professional meetings and publications in scientific journals.

Science in Personal and Social Perspectives (12FSPSP)

Personal and community health

12FSPSP1.1 Hazards and the potential for accidents exist. Regardless of the environment, the possibility of injury, illness, disability, or death may be present. Humans have a variety of mechanisms — sensory, motor, emotional, social, and technological — that can reduce and modify hazards.

12FSPSP1.2 The severity of disease symptoms is dependent on many factors, such as human resistance and the virulence of the disease producing organism. Many diseases can be prevented, controlled, or cured. Some diseases, such as cancer, result from specific body dysfunctions and cannot be transmitted.

Population growth

12FSPSP2.1 Populations grow or decline through the combined effects of births and deaths, and through emigration and immigration. Populations can increase through linear or exponential growth, with effects on resource use and environmental pollution.

12FSPSP2.2 Various factors influence birth rates and fertility rates, such as average levels of affluence and education, importance of children in the labor force, education and employment of women, infant mortality rates, costs of raising children, availability and reliability of birth control methods, and religious beliefs and cultural norms that influence personal decisions about family size.

12FSPSP2.3 Populations can reach limits to growth. Carrying capacity is the maximum number of individuals that can be supported in a given environment. The limitation is not the availability of space, but the number of people in relation to resources and the capacity of earth systems to support human beings. Changes in technology can cause significant changes, either positive or negative, in carrying capacity.

Natural resources

12FSPSP3.1 Human populations use resources in the environment in order to maintain and improve their existence. Natural resources have been and will continue to be used to maintain human populations.

12FSPSP3.2 The earth does not have infinite resources; increasing human consumption places severe stress on the natural processes that renew some resources, and it depletes those resources that cannot be renewed.

12FSPSP3.3 Humans use many natural systems as resources. Natural systems have the capacity to reuse waste, but that capacity is limited. Natural systems can change to an extent that exceeds the limits of organisms to adapt naturally or humans to adapt technologically.

Environmental quality

12FSPSP4.1 Natural ecosystems provide an array of basic processes that affect humans. Those processes include maintenance of the quality of the atmosphere, generation of soils, control of the hydrologic cycle, disposal of wastes, and recycling of nutrients. Humans are changing many of these basic processes, and the changes may be detrimental to humans.

12FSPSP4.2 Materials from human societies affect both physical and chemical cycles of the earth.

12FSPSP4.3 Many factors influence environmental quality. Factors that students might investigate include population growth, resource use, population distribution, overconsumption, the capacity of technology to solve problems, poverty, the role of economic, political, and religious views, and different ways human s view the earth.

Natural and human-induced hazards

12FSPSP5.1 Normal adjustments of earth may be hazardous for humans. Humans live at the interface between the atmosphere driven by solar energy and the upper mantle where convection creates changes in the earth's solid crust. As societies have grown, become stable, and come to value aspects of the environment, vulnerability to natural processes of change has increased.

12FSPSP5.2 Human activities can enhance potential for hazards. Acquisition of resources, urban growth, and waste disposal can accelerate rates of natural change.

12FSPSP5.3 Some hazards, such as earthquakes, volcanic eruptions, and severe weather, are rapid and spectacular. But there are slow and progressive changes that also result in problems for individuals and societies. For example, change in stream channel position, erosion of bridge foundations, sedimentation in lakes and harbors, coastal erosion, and continuing erosion and wasting of soil and landscapes can all negatively affect society.

12FSPSP5.4 Natural and human induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society, as well as cause risks. Students should understand the costs and tradeoffs of various hazards — ranging from those with minor risk to a few people to major catastrophes with major risk to many people. The scale of events and the accuracy with which scientists and engineers can (and cannot) predict events are important considerations.

Science and technology in local, national, and global challenges

12FSPSP6.1 Science and technology are essential social enterprises, but alone they can only indicate what can happen, not what should happen. The latter involves human decisions about the use of knowledge.

12FSPSP6.2 Understanding basic concepts and principles of science and technology should precede active debate about the economics, policies, politics, and ethics of various science - and technology -

related challenges. However, understanding science alone will not resolve local, national or global challenges.

12FSPSP6.3 Progress in science and technology can be affected by social issues and challenges. Funding priorities for specific health problems serve as examples of ways that social issues influence science and technology.

12FSPSP6.4 Individuals and society must decide on proposals involving new research and the introduction of new technologies into society. Decisions involve assessment of alternatives, risks, costs, and benefits and consideration of who benefits and who suffers, who pays and gains, and what the risks are and who bears them. Students should understand the appropriateness and value of basic questions - "What can happen?" - "What are the odds?" - and "How do scientists and engineers know what will happen?"

12FSPSP6.5 Humans have a major effect on other species. For example, the influence of humans on other organisms occurs through land use - which decreases space available to other species - and pollution - which changes the chemical composition of air, soil, and water.

Unit Template

<table>
<tr><td colspan="2">Unit:</td></tr>
<tr><td>Time frame: 1 week</td><td>Text Section:</td></tr>
<tr><td>Essential Questions:</td><td></td></tr>
<tr><td>Unit Content:
•</td><td rowspan="2">Objectives: Students will…
•</td></tr>
<tr><td>Standards:</td></tr>
<tr><td>Biblical Integration:</td><td>Hands-on Activities:
•</td></tr>
<tr><td>TCK Standards:</td><td>Assessment:</td></tr>
<tr><td>Technology Integration:
•</td><td>Additional Resources:
•</td></tr>
</table>

Additional Resources for the Environmental Science Teacher

http://www2.epa.gov/students/lesson-plans-teacher-guides-and-online-resources-educators

(Super rich site – includes projects students can get involved in and many case studies)
http://earthwatch.org/education/teacher-fellowships/teach-earth-united-states/education-lesson-plans
http://www.lessonplansinc.com/science.php?/biology/lessonplans/C96/
http://www.learnnc.org/lp/pages/6675 -
http://www.learner.org/courses/envsci/
http://www.ngsslifescience.com/biology_lesson_plans_ecology_lab.html * super lesson plan site!
http://www.care2.com/channels/ecoinfo/teacher
http://study.com/academy/course/environment-and-humanity.html
http://www.rscn.org.jo/
https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-ecology-2/v/crash-course-ecology-10
http://ww2.odu.edu/~lmusselm/ Dr. Lytton Musselman's site

Case Studies
http://sciencecases.lib.buffalo.edu/cs/collection/results.asp?subject_headings=Environmental%20Science
http://www.environmentalearthsciences.com.au/our-case-studies/

Sources for course description and learning outcomes from:
www1.pgcps.org/
http://www.k12.com/courses/high-school-courses/environmental-science-elective-sci010.overview.html
*www.atlanta.k12.ga.us/cms/lib/.../**Syllabus**ellis.doc*
http://www.ilc.org/school/course_details.php?cId=32413
http://www.cms.k12.nc.us/cmsdepartments/ci/mathandscience/Pages/HSScienceCourses.aspx

Lab: Particulates in the Air

Air Pollution

Levine, Stephen Gordon Upper Grade Center
388-7200

Objectives:
1. To develop a greater awareness of the variety and amount of particulate matter in the air.
2. To determine relationships between amount of pollution and time of day or week.
3. To locate general sources of pollution for the area and to develop some suggestions for improving air quality.

Apparatus Needed:
1. Microscope slides
2. Petroleum jelly
3. Masking tape
4. Magnifying glass or microscopes

Recommended Strategy:
Coat one side of each slide with petroleum jelly. Select several different places within your city or residential area to place the slide; e.g., inside school classroom, outside of school classroom, inside your home, outside your home, window ledges, and field. Label the location on masking tape that you attach to each slide. Each student should have three slides to look at, and these slides should have been placed in the places that I mentioned above.

Expose all slides the same length of time (6 hours, 1 day, 1 week, etc.)

After collecting the slides, place them on a sheet of white paper with coated side up. Examine under strong light with magnifying glass or microscope. Each student should have a microscope for this purpose.

Compare exposed slides with control slides that were left indoors in a closed box or drawer.

I asked the students questions about what they observed on the slides. Some of the questions are as follows:

Which of your slides had the most particles?
Where was this slide placed?
Which of your slides had the fewest particles?
Compare results with your classmates find out who had the slide with the highest particle count. Where was it placed?
What is the likely source of this pollution?
How might this pollution be reduced?
What might be done by individuals, community groups, industry, or government to help to reduced air pollution?

The above questions can also be given on paper and handed out to the students to work on in class.

http://mypages.iit.edu/~smile/bi8713.html