

# Problem-Based Learning Unit Template

Topic	
Water quality	
Goals/Objectives/SOL	
6.1	<p>The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which</p> <ul style="list-style-type: none"><li>a) observations are made involving fine discrimination between similar objects and organisms;</li><li>b) precise and approximate measurements are recorded;</li><li>c) scale models are used to estimate distance, volume, and quantity;</li><li>d) hypotheses are stated in ways that identify the independent and dependent variables;</li><li>e) a method is devised to test the validity of predictions and inferences;</li><li>f) one variable is manipulated over time, using many repeated trials;</li><li>g) data are collected, recorded, analyzed, and reported using metric measurements and tools;</li><li>h) data are analyzed and communicated through graphical representation;</li><li>i) models and simulations are designed and used to illustrate and explain phenomena and systems; and</li><li>j) current applications are used to reinforce science concepts.</li></ul>
<b>Matter</b>	
6.4	<p>The student will investigate and understand that all matter is made up of atoms. Key concepts include</p> <ul style="list-style-type: none"><li>d) two or more atoms interact to form new substances, which are held together by electrical forces (bonds);</li><li>e) compounds may be represented by chemical formulas;</li><li>f) chemical equations can be used to model chemical changes; and</li><li>g) a limited number of elements comprise the largest portion of the solid Earth, living matter, the oceans, and the atmosphere.</li></ul>
6.5	<p>The student will investigate and understand the unique properties and characteristics of water and its roles in the natural and human-made environment. Key concepts include</p> <ul style="list-style-type: none"><li>a) water as the universal solvent;</li><li>b) the properties of water in all three phases;</li><li>c) the action of water in physical and chemical weathering;</li><li>d) the ability of large bodies of water to store thermal energy and moderate climate;</li><li>f) the importance of protecting and maintaining water resources.</li></ul>

## Living Systems

- 6.7 The student will investigate and understand the natural processes and human interactions that affect watershed systems. Key concepts include
- a) the health of ecosystems and the abiotic factors of a watershed;
  - c. divides, tributaries, river systems, and river and stream processes;
  - d. wetlands;
  - f major conservation, health, and safety issues associated with watersheds; and
  - g. water monitoring and analysis using field equipment including hand-held technology

## Earth Resources

- 6.9 The student will investigate and understand public policy decisions relating to the environment. Key concepts include
- c) the mitigation of land-use and environmental hazards through preventive measures; and
  - d. cost/benefit tradeoffs in conservation policies.

## Theme

The impact of an environmental crisis in the form of a hazardous spill in the City of Radford and its surrounding New River Watershed

## Problem question

How can we minimize the possibilities and mitigate the effects of environmental disasters on the New River watershed?

## Scenario

Due to Radford's proximity to the New River, interstate 81, and the railroad lines, Radford's commission on Environmental Quality has determined that a filtration system to protect the ground and surface water needs to be developed. Because of the multiple disaster scenarios, many solutions need to be posed.

## Student Role

Students, as members of Engineers for planning and Mitigation of Environmental Disasters, work together to research and propose proactive solutions.

## Resources

## Culminating Activity

Share your findings and proposals for solutions with Radford's Commission on Environmental Quality and Radford City Administrators.

