Unit Materials List (for 30 students)

Material	Quantity
art sand, uncolored, washed	25 cups (5.9L) or 21 lbs. (9.5 kg)
bottles, plastic, 1L, clear, with cap	15
bottles, plastic, 2L, clear, with cap	13
chart paper	1 pad
cheesecloth	6 square yards (5.0 square meters)
coffee filters, paper, round, 8-12 cup (1.9-2.8L)	150
cornstarch	18 teaspoons (88.7 ml)
cotton balls, jumbo size	400
crayons/markers	30
cups, plastic, clear, 16 oz. (473.2 ml)	80
funnel, approx. 1 cup or 8 oz. (236.6. ml), spout should fit into top of a 2-liter bottle (optional)	1
gloves, utility	1 pair
gravel, aquarium, uncolored	25 cups (5.9L) or 19 lbs. (8.6 kg)
hammer and nail or drill (for teacher use, if not using rubber stoppers with drip holes)	1
knife, utility (for teacher use)	1
marker, permanent	1
measuring cup, liquid, able to hold at least 1 cup (236.6 ml)	1
pans/basins, approx. 20 " x 12" x 3" (50.8 x 30.5 x 7.6 cm)	10
paper, 8.5" x 11"	10 sheets
paper towels	1 roll

Unit Materials List (for 30 students, continued)

Material	Quantity
rubber stoppers, size 4, one hole (optional, can be substituted for bottle cap with drilled hole)	11
screen, nylon, fine, cut into 10"-12" (25.4-30.5 cm) squares	20 square feet (1.9 square meters)
soil, potting	18 tablespoons (266.2 ml)
tablespoon measure	1
tape, masking	1 roll
tape, packing, clear	1 roll
tea, dark, loose	18 tablespoons (approx. 266.2 ml) or the tea from 26-30 tea bags
teaspoon measure	1
timer/wristwatch/stopwatch/clock with second hand	1
water, warm	approx. 6.4 gallons (24.1L)

Note: This materials list does not include Preparatory Lesson materials. See lesson for materials.

Tie-In Science: Science Companion

- Watery Earth
  Lessons:
  - 1: The Wonder of Water
  - 3: Following a Drop of Rain
  - 6: Learning About Frozen Water
  - 7: Learning About Water in the Air
  - 8: Modeling the Water Cycle
  - SBA: Using Models in Science

- Watery Earth
  Lessons:
  - 1: The Wonder of Water
  - 2: Exploring Who Uses Water
  - 12: Walk the Talk—Looking for Pollution
  - 14: Water Resources Case Studies
  - 15: Protecting Water Resources Project

- Watery Earth
  Lessons:
  - 13: Investigating a Way to Clean Water
  - 14: Water Resources Case Studies

- Watery Earth
  Lessons:
  - 13: Investigating a Way to Clean Water
  - 14: Water Resources Case Studies

	ITEEA National Standards and Benchmarks
1 ***Saving Salila's Turtle***	♦ **1D** Tools, materials, and skills are used to make things and carry out tasks. ♦ **6A** Products are made to meet individual needs and wants. ♦ **6C** Individual, family, community, and economic concerns may expand or limit the development of technologies. ♦ **9A** The engineering design process includes identifying a problem, looking for ideas, developing solutions, and sharing solutions with others.
2 **Who are Environmental Engineers?**	♦ **1A** The natural world and human-made world are different. ♦ **4A** The use of tools and machines can be helpful or harmful. ♦ **4B** When using technology, results can be good or bad. ♦ **4C** The use of technology can have unintended consequences. ♦ **5B** Waste must be appropriately recycled or disposed of to prevent unnecessary harm to the environment. ♦ **5C** The use of technology affects the environment in good and bad ways.
3 **Exploring Filter Materials**	♦ **2D** Different materials are used in making things. ♦ **3A** The study of technology uses many of the same ideas and skills as other subjects. ♦ **10A** Asking questions and making observations helps a person to figure out how things work. ♦ **10E** The process of experimentation, which is common in science, can also be used to solve technological problems.
4 **Designing a Water Filter**	♦ **2D** Different materials are used in making things. ♦ **2E** People plan in order to get things done. ♦ **8A** Everyone can design solutions to a problem. ♦ **8B** Design is a creative process. ♦ **8C** The design process is a purposeful method of planning practical solutions to problems. ♦ **8D** Requirements for a design include such factors as the desired elements and features of a product or system or the limits that are placed on the design. ♦ **9B** Expressing ideas to others verbally and through sketches and models is an important part of the design process. ♦ **9C** The engineering design process involves defining a problem, generating ideas, selecting a solution and testing it, making the item, evaluating it, and presenting the results. ♦ **9D** When designing an object it is important to be creative and consider all ideas. ♦ **11B** Build or construct an object using the design process. ♦ **11F** Test and evaluate the solutions for the design problem. ♦ **11G** Improve the design solutions.

Summarized Objectives

Students will be able to

1. define engineer. (Lesson 1)
2. identify and implement the steps of the Engineering Design Process. (Lessons 1, 4)
3. identify multiple ways that air, water, and soil become contaminated. (Lessons 1, 2)
4. discuss some problems and engineering solutions associated with air, water, and soil contamination. (Lessons 1, 2)
5. recognize the role of environmental engineers in helping to address the problems of air, water, and soil contamination. (Lessons 1, 2)
6. identify multiple human uses for air, water, and soil. (Lesson 2)
7. make predictions about the efficacy of different filter materials based on their properties. (Lesson 3)
8. conduct a controlled experiment. (Lesson 3)
9. observe, analyze, and compare the performance of filter materials when used to filter contaminated water. (Lesson 3)
10. decide which materials and/or combination of materials will be good choices for use in a water filter design. (Lesson 3)
11. use prior analyses of filter materials to inform their water filter designs. (Lesson 4)
12. test and analyze a water filter design for strengths and weaknesses. (Lesson 4)
13. "Improve" their designs based on earlier analysis. (Lesson 4)

Activity Assessments

Rubrics have been provided for each lesson. Use the *Rubric Recording Sheets* to organize scores for all students.

Lesson 1

Observe student contributions to the class discussion. Use *Lesson 1 Rubric* {1-7} to evaluate student performance. (Objectives 1-5)

Lesson 2

Students discuss air, water, and soil contamination as they examine a mural. Observe student contributions to the class discussion. Use *Lesson 2 Rubric* {2-7} to evaluate the progress of the class. (Objectives 3-6)

Lesson 3

Students draw or write their observations of filter materials as they experiment to see which are best for cleaning contaminated water. Evaluate student work using *Lesson 3 Rubric* {3-8}. *Be an Environmental Engineer!* {3-1} and *Choosing Materials for a Filter* {3-6} are good sources of information on student understanding. (Objectives 7-10)

Lesson 4

Students plan and construct their water filters. They test and analyze their designs, and then make improvements based upon what they have learned. Analyze student performance during the design challenge using *Lesson 4 Rubric* {4-14}. (Objectives 2, 11-13)

Name: _____ Date: _____

A

B

Pollution and Solutions

Directions: In the story Saving Salila's Turtle, *many types of pollution are mentioned. In the boxes below, fill in the source of each type of pollution. Then try to think of some possible solutions to the pollution!*

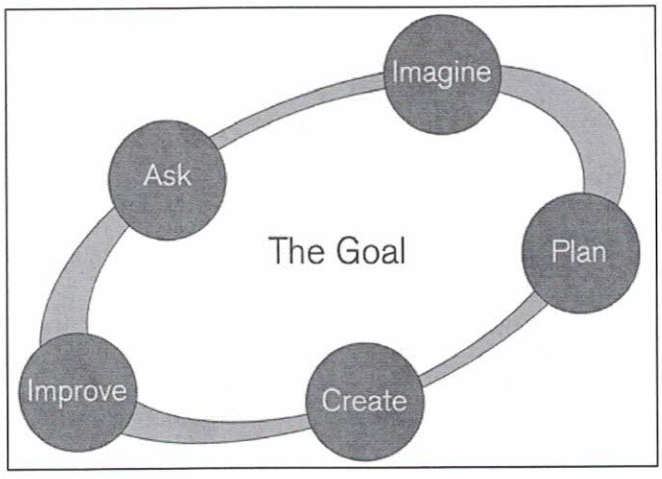
Type of Pollution	Source of Pollution	Pollution Solution!
Oil (p. 6 and p. 14)		
Smoke (pp. 14-15)		
Soap (p. 14)		
Dirt and Twigs (p. 19)		
Bacteria (pp. 18-19)		

Name: _____ Date: _____

B

Salila and the Engineering Design Process

Directions: Salila used the Engineering Design Process to help her design a water filter. Complete the sentences below by filling in the correct step of the Engineering Design Process.



1. Brainstorming combinations of materials to use in the filter was part of the _____ step.

2. Making a drawing of the filter design was part of the _____ step.

3. Thinking about where water comes from and the different ways to purify water was part of the _____ step.

4. Constructing the filter that Salila had planned was part of the _____ step.

5. Changing the filter to make it the best it could be was part of the _____ step.