13.0 (HIGH SCHOOL) "MOCK MUCK" MINI-UNIT

National Curriculum Alignment:

(The following National Curriculum Standards are addressed by completing all of the activities associated with the Water-Aware mini-unit. See http://www.educationworld.com/standards/national for a corresponding key to standards.)

NL-ENG.K-12.1
Reading for Perspective: Students read a wide range of print and non-print documents to build an understanding of texts, of themselves, and of the cultures of the United States and the world.

NL-ENG.K-12.3
Evaluation Strategies: Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts.

NL-ENG.K-12.4
Communication Skills: Students adjust their use of spoken, written, and visual language to communicate effectively with a variety of audiences and for different purposes.

NL-ENG.K-12.5
Communication Strategies: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.

NL-ENG.K-12.6
Applying Knowledge: Students apply knowledge of language structure, language conventions, media techniques, figurative language, and genre to create, critique, and discuss print and non-print texts.

NL-ENG.K-12.7
Evaluating Data: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources to communicate their discoveries in ways that suit their purpose and audience.

NL-ENG.K-12.8
Developing Research Skills: Students use a variety of technological and information resources to gather and synthesize information and to create and communicate knowledge

NL-ENG.K-12.12
Applying Language Skills: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).

Science Grades 6 - 12

NS.9-12.1
Science as Inquiry: Abilities necessary to do scientific inquiry/ Understanding about scientific inquiry

NS.9-12.3
Life Science: Populations and ecosystems/ Diversity and adaptations of organisms/ Interdependence of organisms

NS.9-12.5

Science and Technology: Abilities of technological design/ Understandings about science and technology

NS.9-12.6

Science in Personal and Social Perspectives: Personal health/Populations, resources, and environments/Risks and benefits

Technology Grades 6 - 12

NT.K-12.4

Technology Communications Tools: Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences/ Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

NT.K-12.5

Technology Research Tools: Students use technology to locate, evaluate and collect information from a variety of sources/ Students use technology tools to process data and report results/ Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.

:: **High School**
:: **"Mock Muck": A Water Treatment Simulation**
:: **Level of difficulty and duration: ***

Pre-activities:

Whiteboard brainstorm
1:: As a class, list as many chemicals and other items you can think of that are poured down drains or emptied into water sources such as lakes, rivers, groundwater or kitchen and bathroom drains.
2:: Read "Water-Aware Fact Sheet" to raise student awareness of the global water crisis water.
3:: Students will record answers to pre-lab questions.

> **Pre-lab Questions:**
> 1:: What three water purification techniques will you use?
> 2:: Define filtration-
> 3:: What will you use to measure the volume of your foul water sample?
> 4:: Why should sand be pre-moistened for use during sand filtration?
> 5:: How will you determine whether or not your sample is clean? (Do not test the purity of the water by drinking it.)

Objective:
The "Mock Muck" activity will simulate the water treatment and purification process. The purpose of the activity is to purify a sample of foul water, producing as much "clean" water as possible. The three major techniques used should be oil-water separation, sand filtration and charcoal absorption/filtration. Students will compete in groups to produce the cleanest sample of water at the end of a pre-determined time period such as 30-45 minutes.

Lesson:
Students will develop strategies to create the most effective filtration/treatment system with materials provided. The winning group will produce both the greatest amount of water (retained water from the original sample) as well as the cleanest sample of treated water. Students will write a detailed procedure of how each group plans to purify their water sample. Students will complete the "Mock Muck" Data Worksheet

Materials:
Students will collect a mock sample of polluted/untreated/waste water from the instructor. Instructors will mix a large enough sample to provide each student group with 3 cups of the "mock muck" sample. Suggested items include cooking oil, tuna fish water, chocolate milk (preferably sour), coffee grounds, soy sauce, tomato sauce, etc.

Per student group:
3 cup sample of mock wastewater, 1 coffee filter, ¾ cup of sand and 1 charcoal brick (such as found in a bag of charcoal for grilling). Each student group will need two containers that each hold 3 cups of liquid.

Post-activities:
Students, as a class, will discuss their expectations and experience "treating" the polluted sample. Students, as a class, will generate solutions for people living without access to safe water who are forced to collect it from polluted sources like rivers, ponds and ditches.

MOCK MUCK DATA WORKSHEET DATA TABLE

	Color	Clarity	Odor	Presence of oil	Presence of solids	Volume
Before treatment						
After step one						
After step two						
Final sample						

Analysis:

1:: What percent of the original foul water sample was recovered as "clean water"?
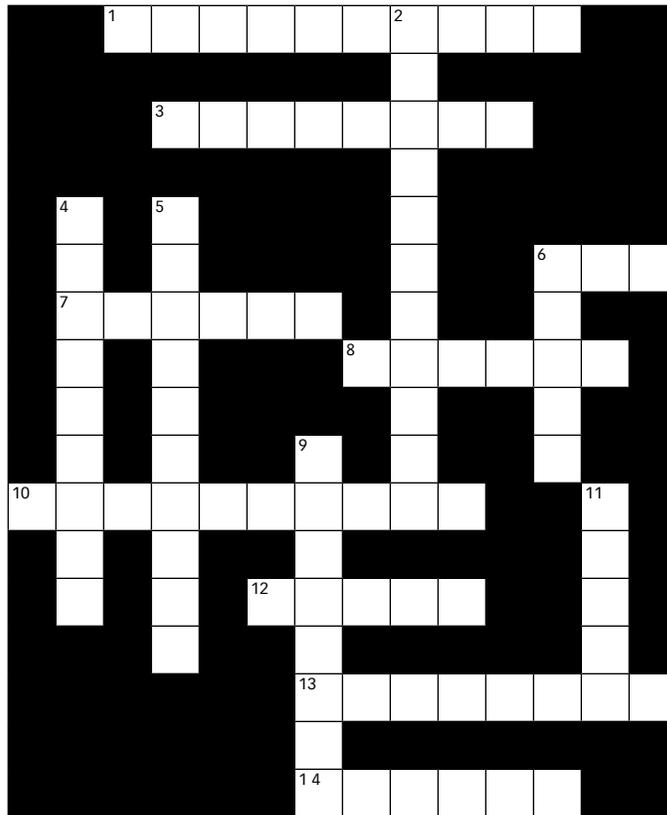(% of water=volume of purified water/ (over the) volume of foul water X 100)

2:: What volume of liquid did you lose during purification?

3:: Compare your purification experiences and data with those from other groups. How should the success of various groups be judged? Write a description of the results from your group and those of your classmates.

Group #	Volume of "clean" water	Clarity ranking
1		
2		
3		
4		
5		
6		

WATER-AWARE FACT PUZZLE

Read the Water-Aware Fact Sheet to help you solve this puzzle,

Across

1 used faster than it can be replaced

3 15 million die a year from water related illness

6 World Health Organization (acronym)

7 continent with minimal percentage of water treatment

8 one-third of world population suffers from water _____

10 farming containment along with pesticide

12 Large cities waste water because of these type of systems

13 more than 1 gallon a day is the bare minimum for _____

14 "value groundwater like any other _____ resource"

Down

2 responsable for 80% of world water consumption

4 increase public and government _____

5 60% of this water is wasted

6 two million tons a day are disposed in freshwater resources

9 diarrhea, typhoid, cholera

11 home to the Ganges River

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        ¹F  R  E  S  H  W ²A  T  E  R
                            G
            ³C  H  I  L  D  R  E  N
                            I
   ⁴A     ⁵I              C
    W        R              U           ⁶W  H  O
   ⁷A  F  R  I  C  A        L           A
    R        I           ⁸S  T  R  E  S  S
    E        G              U           T
    N        A        ⁹D     R           E
¹⁰F  E  R  T  I  L  I  Z  E  R        ¹¹I
    S        T              S              N
    S        I        ¹²L  E  A  K  Y        D
    N        A                              I
            ¹³S  U  R  V  I  V  A  L
             E
            ¹⁴S  C  A  R  C  E
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