Lesson 3: Careers in Water Treatment:
Why are they Needed? Is it my Future?

Purpose

A clean, safe drinking-water supply has contributed significantly to public health and human longevity. Water treatment plant and system operators treat water so that it is safe to drink. Water treatment equipment and processes remove or destroy harmful materials, chemical compounds, and microorganisms from the water. Individuals with a variety of skills and educational backgrounds are necessary to make clean water a reality.

Objective

Students will research careers involving water treatment. Student research teams will meet with employees during a field trip to the Beaver Water District to explore the various careers available.

Students will compare and contrast microorganisms, macro-invertebrates, and other materials found in treated and untreated water.

Arkansas Framework Correlation

Language Arts

7th Grade

OV.1.7.1 Use vocabulary from content area texts and personal reading

OV.1.7.2 Use standard English in classroom discussion and *presentation*s

OV.1.7.4 Demonstrate appropriate eye contact, posture, and volume

OV.1.7.5 Use correct pronunciation and inflection/modulation to communicate ideas and information

OV.1.7.6 Contribute appropriately to class discussion

OV.2.7.1 Demonstrate effective listening skills by exhibiting appropriate body language

OV.2.7.3 Listen attentively for main ideas, details, and organization

OV.2.7.4 Demonstrate attentive listening skills to respond to and interpret speaker's message

OV.3.7.1 View a variety of visually presented materials for understanding of a specific topic

OV.3.7.2 Use appropriate criteria to evaluate media for bias and propaganda

W.5.7.1 Write to develop narrative, expository, descriptive, and persuasive pieces

W.5.7.2 Select the form of writing that addresses the intended audience

W.5.7.3 Create expository, narrative, descriptive, and persuasive writings

W.5.7.10 Write across the curriculum

R.9.7.15 Organize information, including simple outlining

R.9.7.16 Use skimming, scanning, note-taking, outlining, and questioning as study strategies

R.9.7.19 Evaluate personal, social, and political issues as presented in text

R.10.7.5 Use skimming, scanning, note taking, outlining, and questioning as study strategies

R.10.7.6 Organize and synthesize information for use in written and oral presentation

R.10.7.11 Read and utilize functional/practical texts, including forms, reports, cover letters, letterheads, and business letters

R.11.7.3 Add content words to sight vocabulary

R.11.7.6 Use resources to determine meaning of technical and specialized vocabulary

IR.12.7.3 Use print and electronic sources, such as card catalogs and computer databases, to locate information

IR.12.7.7 Develop notes that include main topics, details, summaries, and paraphrasing from multiple types of sources

IR.12.7.9 Use research to create one or more oral, written, or visual presentations /products

Science

7th Grade

NS.1.7.1 Interpret evidence based on observations

PS 5.7.10 Investigate scientists, careers, and historical breakthroughs related to elements, mixtures, and compounds.

Problem Question

What are my options for a career in water treatment? Why are these careers necessary to provide safe drinking water?

BACKGROUND INFORMATION

- There are a variety of career opportunities necessary in providing clean safe drinking water for our communities.
- Each of these careers has its own set of education requirements, duties, and benefits.
- Clean water is vital to the growth and development of communities in our area and around the world.

Timeline

Days 1 and 2: Elicit student background and teacher introduces the history of water treatment, careers in water treatment, and the water treatment process.

Day 3: Field trip to Beaver Water District to research their topic(s) (water treatment and its local history and careers)

2 additional days for student team presentations: 1 to prepare presentation and 1 for presenting.

1-2 days for lab activity with follow-up discussions.

Materials

Activity 1: Field trip to Beaver Water District Administration Building. Presentation materials will vary depending upon the visual chosen by each student research team.

Activity 2: Water Quality Lab Material

- Treated water from Beaver Water District (labeled)
- Untreated water from the community (labeled)
- Droppers
- Slides
- Coverslips
- Microscope

Teacher Preparation

Copy and cut apart one set of "Find Your Water Partner" cards. (See 7 E's, Engage)

Activity 1:

- Arrange for use of the computer lab for research as needed.
- Arrange for library time as needed
- Arrange for materials for student visuals as needed
- Arrange field trip to Beaver Water District and for BWD employees to discuss their careers with the students

Activity 2:

Collect supplies and equipment for Water Quality Lab (Activity 2), including making copies of identification keys for water organisms. A simple key may be found at:

http://www.microscopy-uk.org.uk/index.html?http://www.microscopy-uk.org.uk/pond/index.html

A beginner's picture key of macro-invertebrates may be found on pages 4-7 at: http://www.epa.gov/safewater/kids/wsb/pdfs/683.pdf

Additional Resources

Resources for materials not included:
UA Center for Math & Science Education
http://www.uark.edu/~k12info/
479.575.3875
Northwest Arkansas Education Co-Op
http://starfish.k12.ar.us/web/
479.267.7450
Beaver Water District
www.bwdh2o.org
479.717.3807
Know of other resources? Please let us know!
education@bwdh2o.org or 479.756.3651

7E's Careers in Water Treatment

Elicit

Fishbowl share: Have each student write on a slip of paper something they know about water quality or someone who works with water quality. Walk around with a container (fishbowl) to pick up the slips. Distribute the strips to students so that each may read one aloud to the class. This way no one knows whose slip they are reading. Discuss each statement as it is read

Engage

After following the instructions for the whole group play, display a list of all of the facts on the overhead or with a document camera. Have students in teams of 3-4 read the facts in order again and discuss each at their tables (or grouping of desks).

At the end of class, you might remove the display of facts, and have each student write one interesting fact they learned today about water as an exit slip.

Explore

Activity 1: Field Trip to Beaver Water District Administration Center

Divide students into research teams of 3-4. Each team will research a Beaver Water District career and prepare a visual and oral presentation for the class. (This will mean that on the day of the field trip to BWD, approximately 18-24 students will each have the same career profile and will meet at one time as a large group with a water district employee to hear about his/her career, ask questions, and take notes for a presentation to their class upon returning to school.)

The student-made visual element of the project may be a model (preferred when possible), skit (role playing), puppet show, poster, video, PowerPoint, interactive whiteboard presentation such as a flipchart, foldable, or other teacher-approved visual. The visual element chosen must receive prior teacher approval.

Make it fun! The 3-4 minute classroom oral presentation may be in any teacher-approved format (play, role playing, puppet show, commercial or advertisement, etc.) and should include:

- Introduction (1 minute or less)
    - Introduces students to the topic
    - Sparks interest
    - Lets students know how the topic will be developed
- Organized Body (approximately 2 minutes)
    - Describe the duties of this job
    - What educational background is needed?
    - What is the approximate entry level salary for this job in Arkansas?
- Conclusion (approximately 1 minute)
    - Summarize by explaining the benefits of having a career of this type (tangible and otherwise).

Activity 2: What is Water Quality

Students will conduct an investigation to test and compare the quality of treated water from Beaver Water District with untreated water from the community. Students will look for microorganisms such as algae and protozoa in each type of water.

Teams of 2-3 students will prepare slides of each type of water and make comparisons of the microorganisms found.

Procedure: (**Caution:** Be sure you have **separate, designated droppers** for each water sample to prevent contamination of the slide specimen.)

1. Place a drop of water from the treated water container on a slide.
2. Cover the drop with a cover slip.
3. Place the slide on the stage of the microscope and make observations.
4. Record what you see as drawings in your journal.
5. Repeat steps 1-4 with the untreated water. (Again be sure to use separate droppers.)
6. Identify any microorganisms found using the resources provided by your teacher. Record the identity beside the illustrations in your journal.
7. Label with the type of water in which each organism was found to live.

Explain

Activity 2 Conclusion(s): Students should draw conclusions about the water quality (for drinking purposes) of each water sample. How might water treatment personnel at Beaver Water District use a similar experiment?

Elaborate

Using what has been learned in this lesson, students predict what the future of water treatment may hold and explain their view.

Evaluate

Activity 1: Students will be evaluated on participation in team research, visual element and oral presentation.

Activity 2: Student will be evaluated on team participation, lab management, and journal entries

Extensions

- **Play Beaver Water District's Watershed Jeopardy Challenge for 7th Grade. Download from the Beaver Water District website at www.bwdh2o.org.**

- Arrange for small teams (2-4) of interested students to "job shadow" someone Arkansas Game and Fish Commission or the U.S. Army Corps of Engineers-Beaver Lake.

Find Your Water Partner

1. There is the same amount of water on Earth	as there was when the Earth was formed.
2. The water from your faucet could	contain molecules that dinosaurs drank.
3. Water is composed of	the elements hydrogen and oxygen.
4. H_20 means there are	2 atoms of hydrogen and 1 atom of oxygen in one molecule of water.

5. Nearly 97% of the world's water is	salty or otherwise undrinkable.
6. 2% of the world's water is	locked in ice caps and glaciers.
That leaves just 1% of the world's water for	all of humanities needs – all its agricultural, residential, manufacturing, community, and personal needs.
8. Water regulates	the Earth's temperature.
9. Water also regulates the temperature of the human body,	carries nutrients and oxygen to cells, cushions joints, protects organs and tissues, and removes wastes.
10. 75% of the human brain	is water and 75% of a living tree is water.

11. A person can live about a month without food,	but only about a week without water.
12. Water is part of a deeply interconnected system. What we pour	on the ground ends up in our water, and what we spew into the sky ends up in our water.
13. The average total home water use for each person in the U.S.	is about 50 gallons a day.
14. The average cost for water supplied to a home in the U.S.	is about $2.00 for 1,000 gallons, which equals about 5 gallons for a penny
15. Water expands by 9% when it freezes. Frozen water (ice) is	less dense than water, which is why ice floats in water.

Facts for Find Your Water Partner taken from US EPA (http://epa.gov/ogwdw/kids/waterfactsoflife.html)

Instructions to Find Your Partner

1. Copy and cut apart cards.
2. Each student is given a card that matches another student's card.
3. Direct students to find the person with the card that matches theirs in order to make a complete water statement or statements.
4. Students then are to form a circle around the room in numerical order while facing the center.
5. Have each student in pair 1 read their part of the card. Tell students to continue to read in order until all cards are read.
6. Have students return cards to designated area.