Trusting the Source Lesson Plan

GOALS

Examine the drinking water treatment process–from the source to their faucet.

Explore four drinking water parameters that we are going to test - heavy metals, pH, turbidity, dissolved oxygen.

Investigate the relationship between water treatment and public health.

OBJECTIVES

By the end of this program students will be able to:

Describe the importance of drinking water and its impact on human health and physiology.

Summarize the drinking water treatment process - from the source to the faucet.

Demonstrate collection of tap water samples and test samples for heavy metals, pH, turbidity, and dissolved oxygen using colorimetric and XRF analysis.

Interpret results of four drinking water parameters against EPA health standards.

Evaluate water testing results and hypothesize how water treatment processes may impact findings.

Construct a *Tap Water Quality Report* with results from the activity and share findings with their parents and guardians.

Investigate and reflect on the relationship between water treatment and public health.

GUIDED PRACTICE

Teach fundamentals of water quality to ALL science classes.

From the Ground to the Glass

- Where does water come from?
- Treatment plant journey (water infrastructure)
- Four drinking water parameters to be tested - heavy metals, pH, turbidity, dissolved oxygen–and why these parameters are important.
- Public health impacts

Optional participation in the *Environmental Explorers Program**

Research Methods (from observation to presentation)

- Survey distribution (pre- and post-survey)
- Tap water testing
- Data analysis (tap water quality analysis)
- Household report findings
- Community dissemination

MATERIALS

Introductory video

From the Ground to the Glass activity books

Surveys (pre- and post-program)

Tap water testing mobile laboratory

Tap water testing reports

Excel (or Google Sheets)

Environmental Explorers Program activation code*****

Environmental Explorers Program activity kit*****

CHECK FOR UNDERSTANDING

Students will complete exercises from the activity book.

Students will fill out their individual tap water quality testing reports and explain their findings with their parents and guardians.

Students will present to results to their peers, fellow students, the Blackburn Community, and the West Jackson community.

Students will have the opportunity to complete the 25 modules available through the *Environmental Explorers School******.

*******The Environmental Explorers School is a free, online, self-paced course that exposes middle school students to 25 environmental health topics ranging from air quality to water pollution.*

Sample Schedule for Trusting the Source Activities	Pre-Unit	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Acquire necessary supplies & equipment*	■								
Compile information about local water sources and public water systems for lesson plans.	■								
Reach out to parents with information about upcoming unit and classroom activities.	■								
Facilitate preliminary classroom discussions about environmental health and advocacy.		■							
Introduce topics of water quality and local historical events related to water.		■							
Guided Practice – *From the Ground to the Glass*		■	■	■	■				
Notify parents of upcoming water testing activities.				■					
Demonstrate collection of home tap water samples during class time.					■				
Distribute pre-assembled collection kits and written instructions to students.					■				
Students collect tap water samples from home.**					■	■			
Students test samples for pH, turbidity, dissolved oxygen in class.**					■	■			
Review findings with class.						■	■		
Students investigate relationship between water treatment and public health.						■	■		
Interpreting results of four drinking water parameters against EPA health standards.						■	■		
Evaluation of water testing results.						■	■		
Hypothesis of how water treatment processes may impact findings.						■	■		
Students complete individual tap water quality testing reports.							■	■	
Students investigate & reflect on relationship between water treatment and public health.							■	■	
Students share findings to their parents/guardians.									■
Students present results/findings to peers and the greater community.									■

**See Trusting the Source - Supplies & Equipment for list of necessary materials*
***Class size may require sampling and testing schedules to vary. Duration of class time may limit the number of samples able to be analyzed in a single day. For best practice, students should collect samples the morning of testing.*
****The above table is a sample schedule that may be used for educators interested in piloting the Trusting the Source program in their classrooms, following an 8-week schedule.*

Study ID:

Dear Blackburn Community Resident,

Thank you so much for working with us to test your tap water on_____. This report summarizes your findings and summarizes levels across the Blackburn community.

DEFINITION OF PARAMETERS TESTED

Dissolved Oxygen (DO): *Dissolved oxygen measures the amount of oxygen dissolved in the water (or the amount of oxygen available to living aquatic organisms).* When measuring drinking water quality, healthy water should have a DO concentration above 6.5-8 mg/L. High dissolved oxygen levels benefit drinking water, as they improve the taste; however, they are linked to rapid corrosion of water pipes. Once a pipe corrodes, it can release particles into your tap water.

Potential Hydrogen (pH): *The pH scale runs from 0 to 14 and measures water's acid or base quality. A pH of 7 is neutral, a reading below 7 is acidic, and one above 7 is basic.* The recommended pH level for tap water is between 6.5 and 8.5.

Turbidity: *Turbidity is a measure of cloudiness in liquids. It has been recognized as a simple and basic signal of water quality. 1 NTU* is the acceptable limit of turbidity as set by the Environmental Protection Agency.

Presence of Lead: We measure the presence of lead in your tap water using either a YES or NO analysis.

RESULTS

We use three metrics to summarize tap water levels in your community.

- Average: This represents the average level of dissolved oxygen, pH, and turbidity across all households we tested in your community.
- Standard Deviation: This represents the general spread around the average levels across all households we tested in your community.
- Maximum: This represents the maximum level observed in samples we tested in your community.

All Blackburn Middle School Households Tested			**83**			
Table 1: Tap water results for dissolved oxygen, pH, and turbidity for your water sample						
	Dissolved Oxygen (mg/L)		**pH**		**Turbidity (NTU)**	
	Measured Level	*Recommended Level*	*Measured Level*	*Recommended Level*	*Measured Level*	*Recommended Level*
Your Tap Water Sample		**6.5-8 mg/L**		**6.5 - 8.5**		**0-1 NTU**
	Average (Standard Deviation)	*Maximum*	*Average (Standard Deviation)*	*Maximum*	*Average (Standard Deviation)*	*Maximum*
All Blackburn Households	**11.07 ± 1.95 mg/L**	**16.4 mg/L**	**7.99 ± .59**	**8.7**	**.89 ±1.27 NTU**	**5.00 NTU**

Table 2: Presence of lead in your tap water sample	
Your Tap Water Sample	**Percentage of households in Blackburn community, MS, that have a presence of lead in their tap water**
No presence of Lead	**0%**

If we find lead in the tap water we test for your household, we will contact you personally and take additional steps.

WHO CAN I CONTACT IF I AM CONCERNED ABOUT MY TAP WATER RESULTS?

- JXN Water: 601-500-5200
- You can contact the MSDH Bureau of Public Water Supply at (601) 576-7518.
- Contact EPA's Safe Drinking Water Hotline at 1-800-426-4791.

HOW DOES MY TAP WATER COMPARE WITH TAP WATER ACROSS MISSISSIPPI?

If you want to see how your tap water samples compare to those across Mississippi, visit Community Noise Lab's Tap Water Dashboard at https://communitynoiselab.org/bar-charts/.

ARE YOU INTERESTED IN EARNING $175?

If you are the parent of a child who is 12 or 13 years old, you are eligible to participate in the Mississippi Adolescent Environmental Health Study! We have attached a brochure with information on what this study entails and how you and your child can earn $175 by participating. If you are interested in participating, you can scan the QR CODE below to register.

ABOUT COMMUNITY NOISE LAB

Community Noise Lab is a Brown University School of Public Health research lab. Dr. Erica Walker, an Assistant Professor of Epidemiology at Brown School of Public Health, founded it. Dr. Walker was also born and raised in Jackson, Mississippi. She is working in Mississippi to understand how and to what extent noise, air pollution, and water quality impact the health and well-being of communities in Greater Jackson. She believes in environmental justice, impactful, meaningful, and transparent community engagement, and leaving things better than we find them. If you have any additional comments or concerns, please feel free to contact Dr. Erica Walker at **erica_walker@brown.edu** or Dr. Cristina Nica at **cristina_nica@brown.ed**

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Required supplies & equipment for water quality testing

TAP WATER TESTING MOBILE LABORATORY

The following is a list of materials required to complete water quality testing as part of Trusting the Source classroom-based activity. Required materials may vary based on equipment manufacturer or model specifications. Educators should reference their equipment's operational manual for detailed material lists and procedures.

COLLECTING SAMPLES

- Intake sheet to record date of collection, well status, and filter presence
- Instruction card
- 3 Sealable plastic containers (4 oz.)
- 1 Plastic bag to transport samples

DISSOLVED OXYGEN

- 1 Portable colorimeter
- 1 High Range Dissolved Oxygen AccuVac® Ampul
- 1 Polypropylene beaker, 50-mL
- 1 Stopper for 18-mm tubes and AccuVac Ampul
- 1 Sample cell
- 1 Dissolved oxygen meter (for validation of results)

pH

- 1 Portable colorimeter
- 1.0 mL Phenol Red Indicator Solution, spec grade
- 1 Dropper with 0.5 and 1.0 mL marks
- 2 Sample cells, with caps
- pH 7.0 buffer solution for calibration

TURBIDITY

- 1 Portable colorimeter
- 2 Sample cells, with caps
- 10 mL deionized water (to prepare blank)
- 5.0 mL Formazin Stock Solution, 4000 NTU (to prepare standard solution for validation of results)
- 95 mL deionized water (to prepare standard solution for validation of results)

HEAVY METALS*

- 1 Portable X-ray fluorescence (XRF) spectrometer

** Samples were tested for Heavy Metals (Lead) by CNL staff in the Jackson, MS lab outside of class activity.*

Supplementary Table 3: Pre and Post Survey Items Comprising Trust Scale

Source	Survey Question	Trust Construct	Range
Pre-Survey	My tap water is safe to drink.	Water	1-5
Pre-Survey	I trust my water utility company.	Entity/ Organization	1-5
Pre-Survey	I trust my water utility company to update my water infrastructure.	Entity/ Organization	1-5
Pre-Survey	I trust my state and local government to permit the updating of my water infrastructure.	Entity/ Organization	1-5
Pre-Survey	I trust the Environmental Protection Agency (EPA) to maintain water standards.	Entity/ Organization	1-5
Pre-Survey	How confident are you that your city's water supply meets health and safety standards?	Water	1-5
Pre-Survey	How confident are you that the water quality reports local authorities provide are accurate?	Entity/ Organization	1-5
Pre-Survey	Do you trust the water supply after being placed under a 3rd party manager?	Water	1-3
Post Survey	After seeing your tap water test results, I believe my tap water is safe to drink.	Water	1-5
Post Survey	After seeing your tap water test results, I feel better about my tap water.	Water	1-5
Post Survey	I trust my water utility company.	Entity/ Organization	1-5
Post Survey	I trust my mayor and city council to keep my drinking water safe.	Entity/ Organization	1-5
Post Survey	I trust my governor to keep my drinking water safe.	Entity/ Organization	1-5
Post Survey	I trust my JXN Water to keep my drinking water safe.	Entity/ Organization	1-5
Post Survey	I trust my state and federal congressmen and senators to keep my drinking water safe.	Entity/ Organization	1-5
Post Survey	After seeing your tap water results, how confident are you that your city's water supply meets health and safety standards?	Water	1-5
Post Survey	After seeing your tap water results, how confident are you that local authorities' water quality reports are accurate?	Entity/ Organization	1-5
Post Survey	After seeing your tap water results, do you trust your tap water?	Water	1-3

Note: Trust constructs labeled as "Entity/ Organization" refer to authoritative organizations, groups, or individual positions inherently responsible for delivering safe drinking water.