

MEASURING ENVIRONMENTAL HEALTH LITERACY

Health Literacy Annual Research
Conference (HARC)

Integrated Health Literacy Research /
Practice / Policy

October 20, 2020

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presentation was supported by the
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Health Sciences.



Marti Lindsey's PhD is in information Science. She has studied EHL for fifteen years, describing the knowledge and skill items that define EHL. She integrates public health outreach with environmental health sciences research, drawing upon her experiences with teaching, toxicology, and community engagement, to share information resulting from the research of toxicologists and environmental health scientists with public, tribal, and the K-12 education communities. Important to her work is to inform people in plain language about the health effects of environmental pollution, without causing distress.

INTRODUCTION TO EHL

Overview

Introduction to Environmental Health Literacy –
Marti Lindsey & Ben Richmond

Connections to Health Literacy – Anna Hoover

Methods – Kathleen Gray

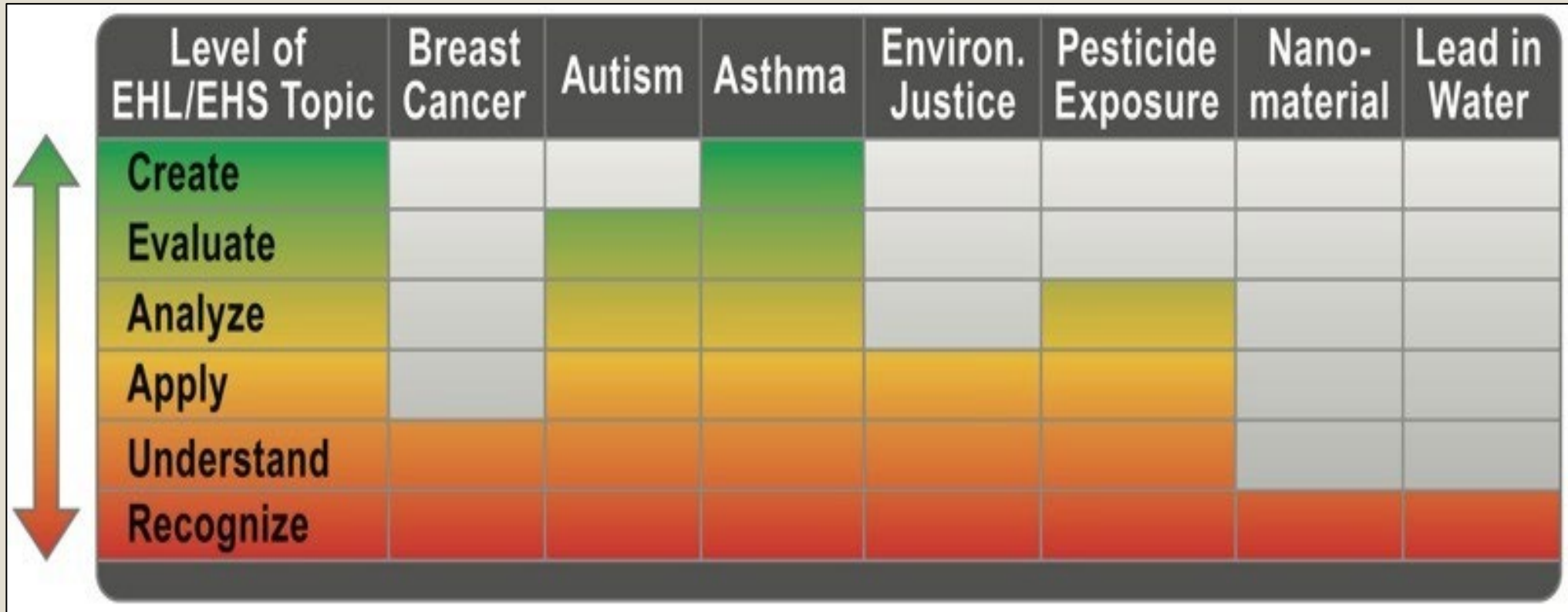
Findings – Victoria Triana

Discussion– Marti Lindsey & Ben Richmond

Objectives

Participants will be able to:

- Identify knowledge and skills associated with environmental health literacy (EHL)
- Compare an EHL measurement tool to the Newest Vital Sign
- Discuss the interaction of knowledge, skills and self-efficacy in health-promoting behaviors



Level of EHL/EHS Topic	Breast Cancer	Autism	Asthma	Environ. Justice	Pesticide Exposure	Nano-material	Lead in Water
Create							
Evaluate							
Analyze							
Apply							
Understand							
Recognize							

Conceptual Model of EHL

Finn & O'Fallon (2017), adapted from Bloom (1956)



Ben Richmond, MPH leads a wide range of programming that aims to promote EHL. This includes the youth programming efforts of the Southwest Environmental Health Sciences Center at the University of Arizona with programs that target students as young as 5th grade to community college students and engages them in university research and environmental health science. In addition, Ben works on EHL research projects that aim to discover best practices in risk communication and communicating complex environmental health research in general to the public.

INTRODUCTION TO EHL

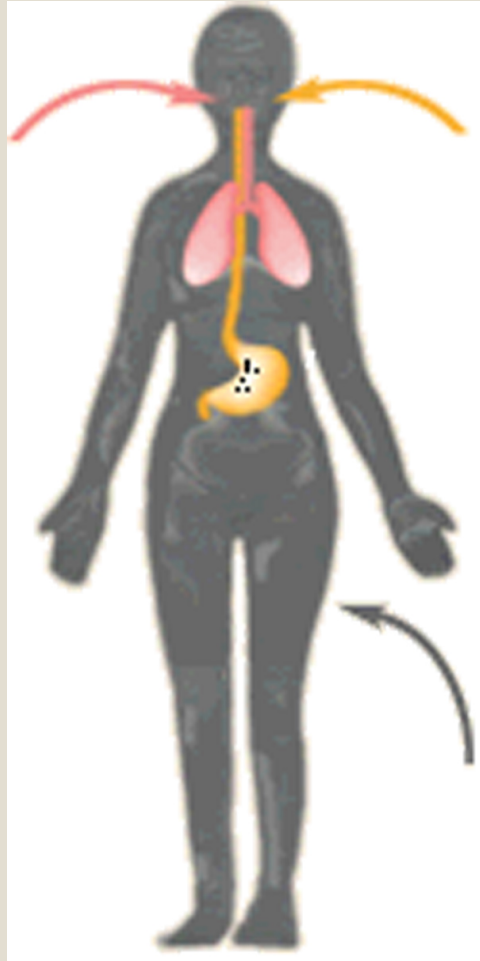


What's your disciplinary background?

What is EHL?

An emerging framework that defines the **knowledge and skills that prepare people to make environmentally healthy and protective decisions** for themselves, their families and their communities, using available environmental data.

What is EHL?



- Knowledge of health effects of an environmental exposure
- Ability to seek out and use environmental health information for oneself, one's family and community
- Positive perceptions of efficacy related to health promoting behaviors

Essential EH Knowledge

Understanding:

- Environmental exposures influence health
- Harmful impacts of specific environmental agents
- Environmental agents can...
 - Enter the body through three primary routes: ingestion, inhalation and dermal absorption
 - Be reduced but not always avoided

Awareness that:

- Reliable information about environmental exposures can be provided through research
- Research on how environmental exposures influence health takes a long time

Valdez et al. (2014), Gray & Lindsey (2019)

Essential EH Skills

Ability to:

- Determine reliability of information sources
- Identify well-known or established hazards in one's environment
- Find information about...
 - Hazards in one's microenvironment (home or workplace)
 - Regional/community environmental hazards and issues
 - How to reduce environmental health risks
- Convey concerns about environmental health risks to others

Valdez et al. (2014), Gray & Lindsey (2019)



Development of EHL proceeds along a continuum, and progress at each stage informs the next.

These stages are key to understanding and applying emerging scientific findings, as is now occurring now with covid-19.

*Please enter your
response in the
chat.*

Participant question:

**Why might it be useful to
understand an audience's
level of EHL?**

Measuring EHL: A Collaboration

Funded collaboration between Core Centers at UNC-Chapel Hill, University of Arizona and University of Kentucky:

- To **build capacity of educators** to understand the EHL levels of their audiences
- To **inform development of tailored educational materials** for audiences of varying EHL Levels
- To **enable measurement of effectiveness** of interventions and programs





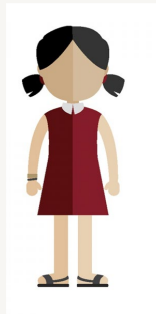
Anna Goodman Hoover, PhD, is an assistant professor in the University of Kentucky College of Public Health. A communication researcher, she incorporates in her work the impact of both knowledge gaps and legacy distrust on the capacity of at-risk populations to understand health hazards and take protective action. Her recent work in Appalachian environmental health literacy has surfaced a need for more accessible, understandable, audience-centered information to help people protect themselves from diseases linked to environmental exposures. Much of her research and professional service center on developing and implementing processes that encourage community-engaged, evidence-informed health decisions.

CONNECTIONS TO HEALTH LITERACY

Health Literacy

“The degree to which individuals have the capacity to obtain, process, and understand basic health information needed to make appropriate health decisions.”

Focus includes:



- Ability to read/comprehend health-related materials
- Improving personal responsibility for health
- Improving individual ability to navigate the healthcare system

-Healthy People 2020

Environmental Health Literacy

“[A]n emerging area of study that incorporates content and strategies from environmental, health, and social sciences to promote understanding of the ways environmental contaminants affect health.”

Focus includes:

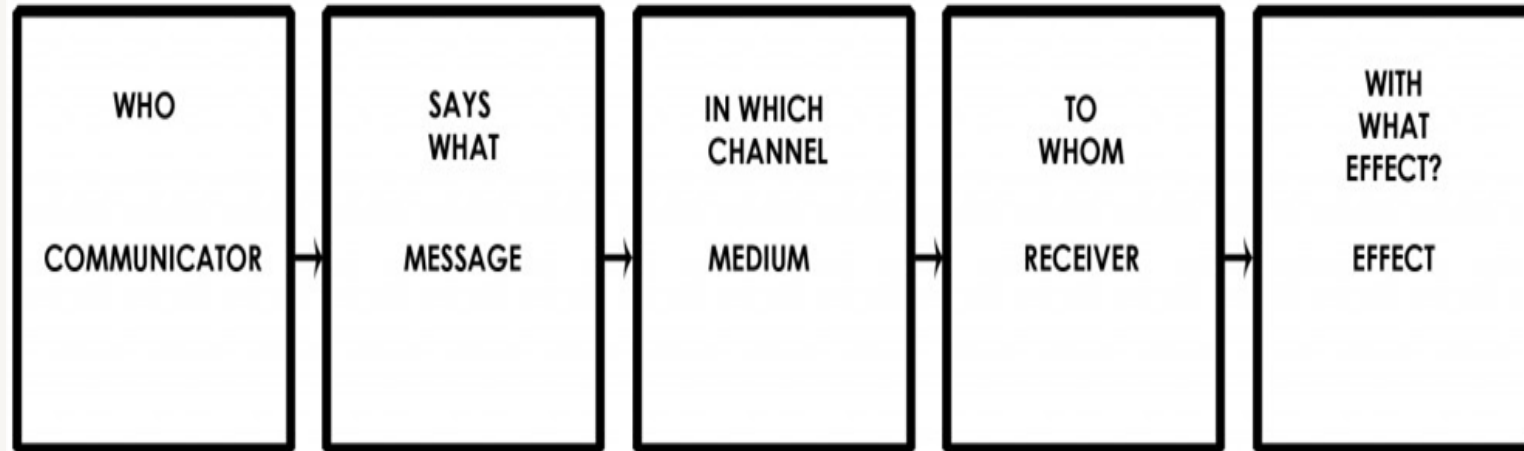
- Ability to comprehend environmental health risks
- Knowledge and skills needed to create, implement, and evaluate prevention and mitigation solutions



-Hoover (2019)



How Do They Differ?



Lasswell's Communication Model (1948)

Learning across Literacies

To understand connections between EHL and health literacy, researchers used the widely-accepted and validated health literacy instrument, the Newest Vital Sign (NVS), and a self-efficacy survey adapted for this environmental health context.



Kathleen M. Gray, PhD, MSPH

Director, Center for Public Engagement with Science and
Research Associate Professor

UNC Institute for the Environment

Community Engagement Core Leader

UNC Center for Environmental Health and Susceptibility
and UNC Superfund Research Program

My EHL work addresses fish consumption advisories, well
water contamination, and the potential health effects of
climate change.

METHODS

Methods

Participants

- Residents of communities with toxic metals contamination in wells
- Undergraduate students in large public universities (non-STEM majors)

Focus Groups: 4 in NC (N=47), ongoing in AZ

- 8-12 participants in each
- Surveys administered and artifacts collected
- Focused discussion audiotaped and transcribed
- Identified *a priori* and emergent codes
- Developed codebook

Newest Vital Sign: A Process-Focused Approach to Measurement



Score Sheet for the Newest Vital Sign Questions

This information is on the back of a container of a pint of ice cream.

1. If you eat the entire container, how many calories will you eat?
2. If you are allowed to eat 60 grams of carbohydrates as a snack, how much ice cream could you have?
3. Your doctor advises you to reduce the amount of saturated fat in your diet. You usually have 42 g of saturated fat each day, which includes one serving of ice cream. If you stop eating ice cream, how many grams of saturated fat would you be consuming each day?
4. If you usually eat 2,500 calories in a day, what percentage of your daily value of calories will you be eating if you eat one serving?

Pretend that you are allergic to the following substances: penicillin, peanuts, latex gloves, and bee stings.

5. Is it safe for you to eat this ice cream?
6. Why or why not?

ANSWER CORRECT?

Yes	No

Number of correct answers:

Newest Vital Sign

Retrieved from:

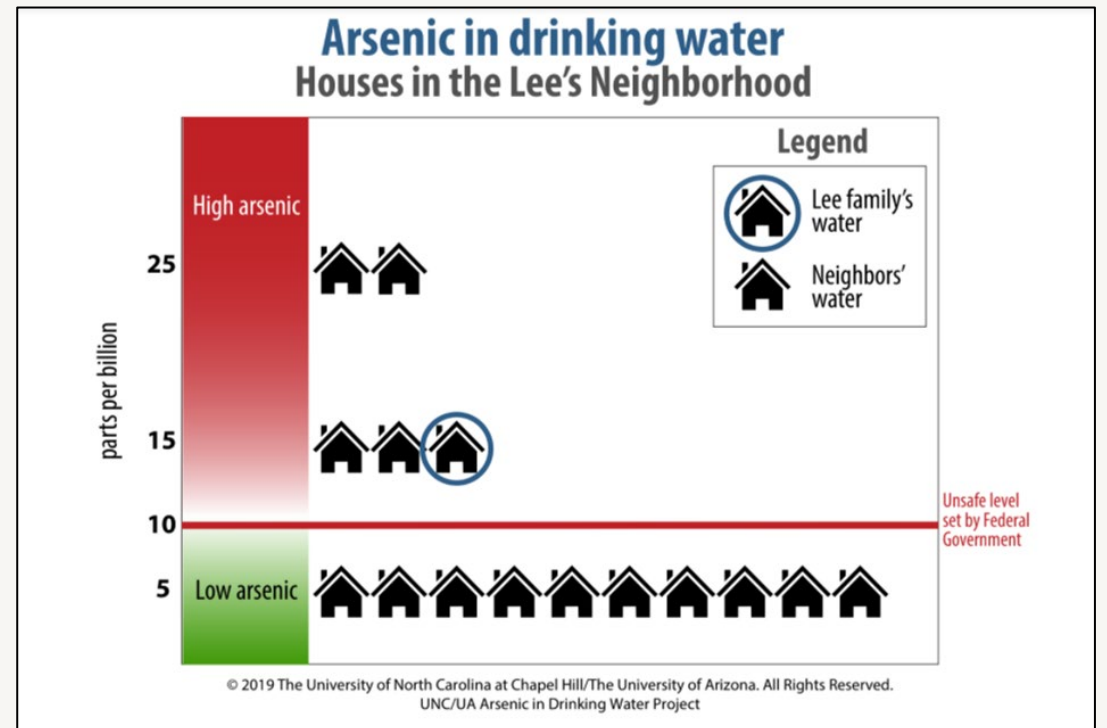
https://www.pfizer.com/files/health/nvs_flipbook_english_final.pdf

Nutrition Facts			
Serving Size			½ cup
Servings per container			4
Amount per serving			
Calories	250	Fat Cal	120
			%DV
Total Fat	13g		20%
	Sat Fat 9g		40%
Cholesterol	28mg		12%
Sodium	55mg		2%
Total Carbohydrate	30g		12%
	Dietary Fiber 2g		
	Sugars 23g		
Protein	4g		8%

*Percentage Daily Values (DV) are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Ingredients: Cream, Skim Milk, Liquid Sugar, Water, Egg Yolks, Brown Sugar, Milkfat, Peanut Oil, Sugar, Butter, Salt, Carrageenan, Vanilla Extract.

Draft Instrument to Measure EHL



Draft Instrument to Measure EHL (cont'd)

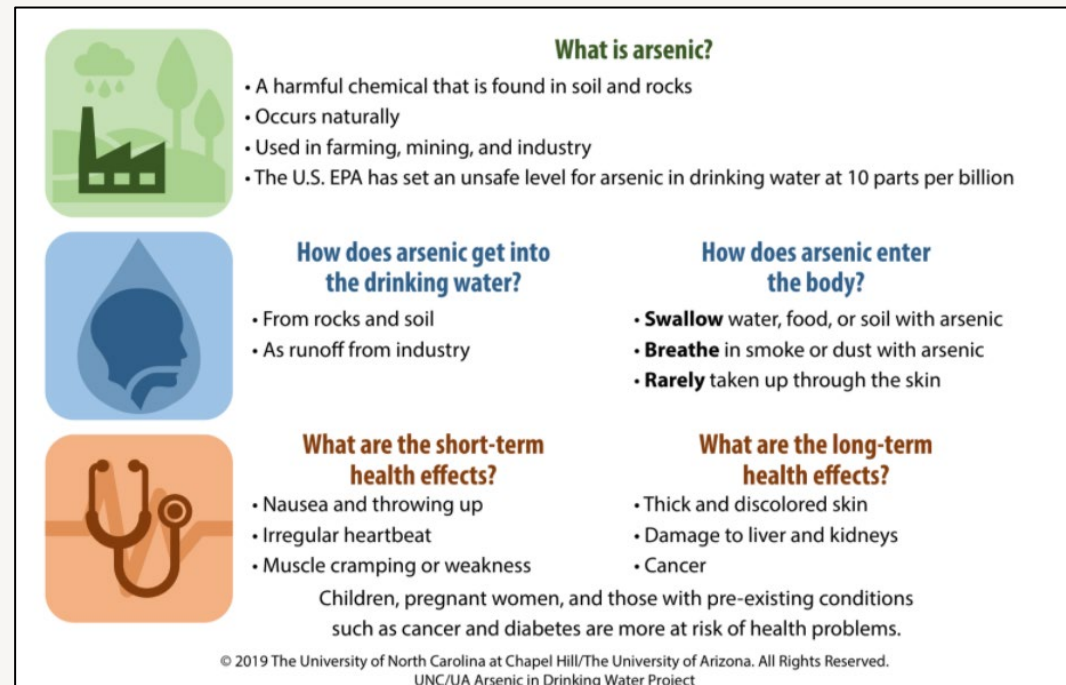
Selected Guiding Questions for Scenario

Knowledge

- Is it safe for the family to drink their well water?
- Can they bathe in it?
- Why might some family members' health be affected and not others?

Skills

- Where could they get additional information?



The infographic is titled "What is arsenic?" and is divided into several sections. It features icons for a factory, a water drop, and a stethoscope. The text is organized into columns and rows, providing information about the source, entry into the body, and health effects of arsenic.

What is arsenic?

- A harmful chemical that is found in soil and rocks
- Occurs naturally
- Used in farming, mining, and industry
- The U.S. EPA has set an unsafe level for arsenic in drinking water at 10 parts per billion

How does arsenic get into the drinking water?

- From rocks and soil
- As runoff from industry

How does arsenic enter the body?

- **Swallow** water, food, or soil with arsenic
- **Breathe** in smoke or dust with arsenic
- **Rarely** taken up through the skin

What are the short-term health effects?

- Nausea and throwing up
- Irregular heartbeat
- Muscle cramping or weakness

What are the long-term health effects?

- Thick and discolored skin
- Damage to liver and kidneys
- Cancer

Children, pregnant women, and those with pre-existing conditions such as cancer and diabetes are more at risk of health problems.

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UNC/UA Arsenic in Drinking Water Project



What knowledge is essential for understanding implications of well test results?



Which skills are essential for acting on well test results?

Draft Instrument to Measure EHL (cont'd)

Selected Self-Efficacy Questions

- I can learn whether my well water contains arsenic.
- I can do the kinds of things needed to remove arsenic from my well water.
- I can find reliable information about any risks of arsenic in well water.
- I can share with others the information I learn about any risks of arsenic in well water.





Victoria Triana

Research Assistant, UNC Institute for the Environment
Victoria is passionate about promoting understanding of environmental and health science among lay publics. She supports multiple environmental health projects by developing activities and materials to engage professional and public audiences. Her experience with qualitative and quantitative analysis enables her to play a vital role in research initiatives and program evaluation, on topics ranging from EHL to Healthy Homes.

FINDINGS

Moderate Correlation Between Health Literacy (HL) & EHL Scores

Results (N=47)

Health Literacy (mean score) = 4.77 ± 1.71

EHL (mean score) = 4.12 ± 1.46

- Both assessment rubrics out of 6 points with different scoring increments
 - Not all questions were scored
- Allowed for analysis of correlations between participants' scores

Differences in HL & EHL Between Groups

	NC Community (n=24)	NC Student (n=23)
Mean HL Score	3.91±2.00	5.58±0.78
Mean EHL Score	3.59±1.54	4.63±1.20

- Scores modeled on NVS scoring system:
- Score of 4-6 almost always indicated adequate literacy.
 - Score of 2-3 indicated possibility of limited literacy.
 - Score of 0-1 suggested limited literacy.

Differences in Self-efficacy Between Groups

Self-efficacy scores were similar except:

- **I can learn whether my well contains arsenic...**
 - If a water testing facility is nearby (within a 1-hr drive)
 - If a water test costs \$50 or less
 - If a water test costs more than \$50
- **I can do the kinds of things needed to remove arsenic from my well water...**
 - If the recommended treatment costs more than \$100

Mean ratings for each question were compared between students and community

Ongoing Analysis of Group Discussions

Knowledge

- Water sources: varied knowledge between groups
- Broad EH concepts
 - Hazards, health effects

Skills

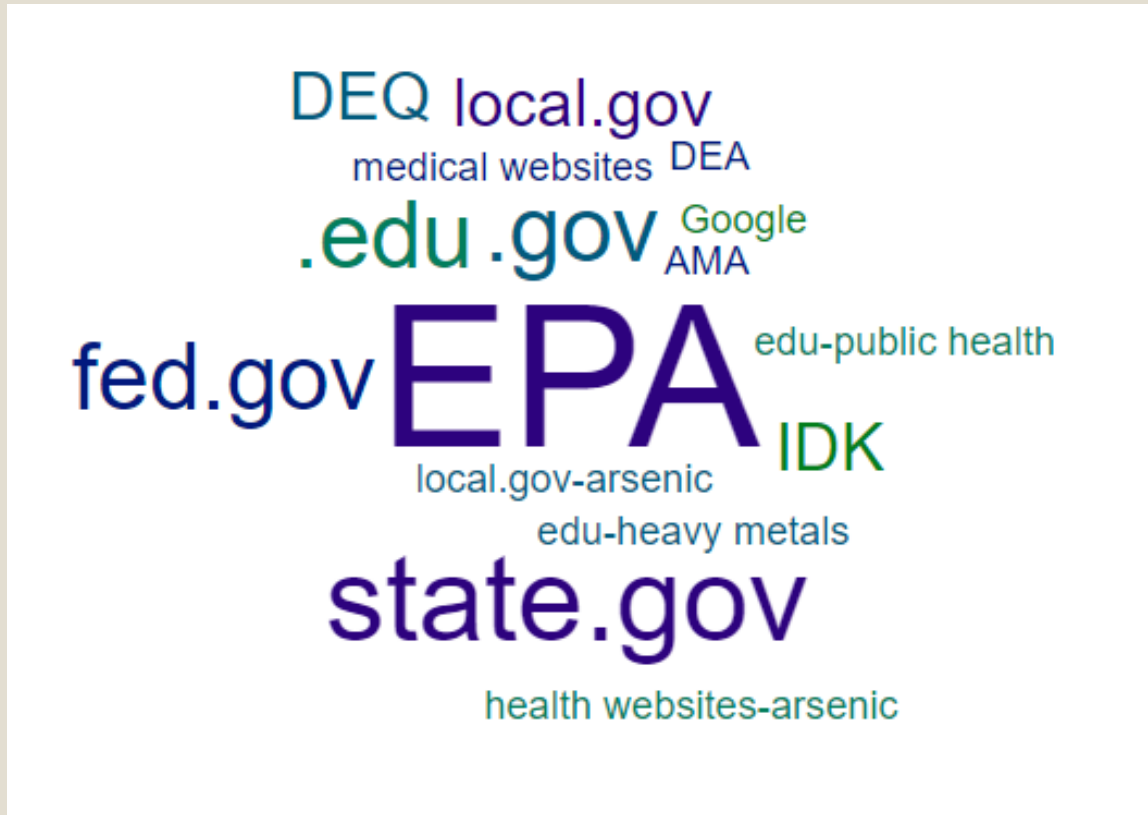
- Finding reliable information

*Please enter your
response in the
chat.*

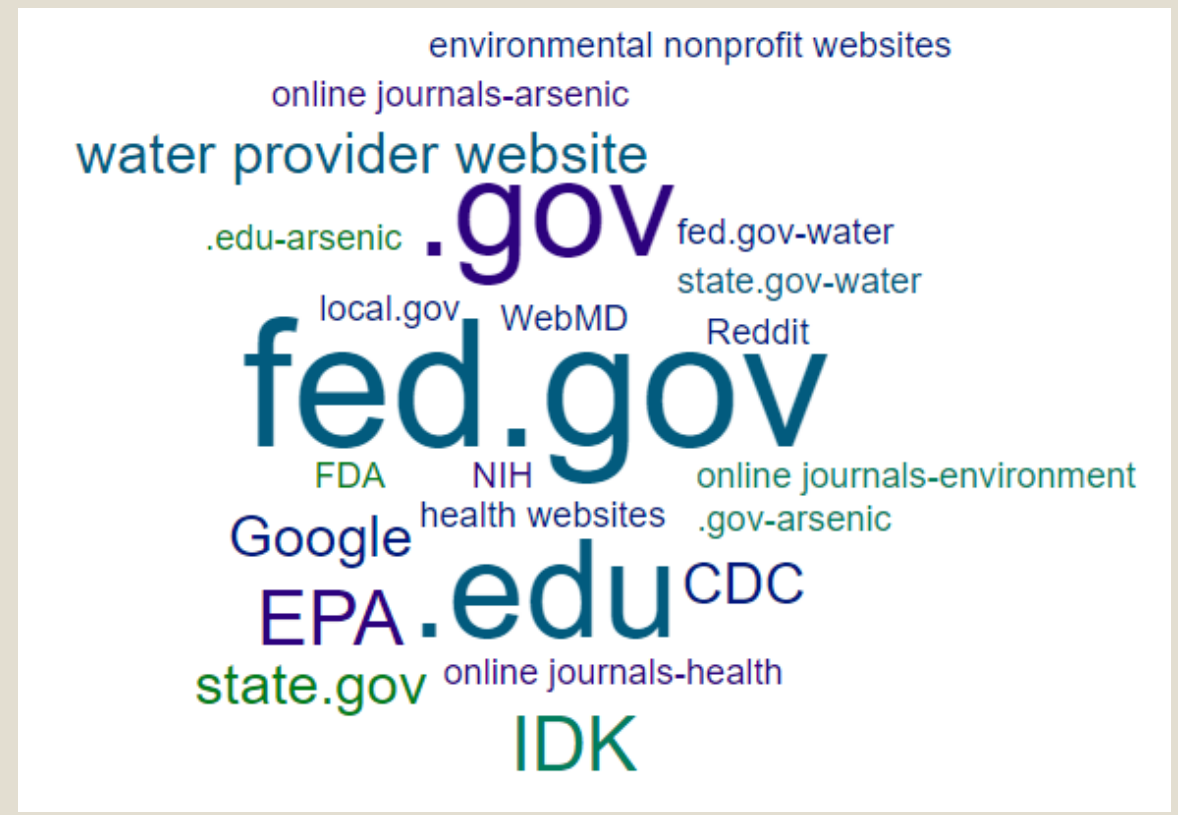
Participant question:

**Which websites would you
check to find information
about contaminants in
drinking water?**

Reliable Information Sources Identified by NC Community & Student Groups



NC Community



NC Students

Summary

- EHL is an emerging framework and can be represented along a continuum
- Knowledge, skills and self-efficacy are key components
- Understanding EHL among varied populations can inform community engagement and communication efforts



Your questions?

Thank you!

University of Arizona

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UNC-Chapel Hill

Melissa Troester, PhD

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NIEHS

Liam O'Fallon

Symma Finn, PhD



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