

## Eliciting Student Thinking

### Population, Water Consumption and Water Levels

<p><b>Author(s)</b></p> <p><b>Simulations for Secondary Science Teachers Conference</b></p> <p>Yvonne Ayesiga Dr. Sara Flanagan Dr. Jamie Mikeska Dr. Michelle Schepakow Dr. Jennie Carr</p> <p><b>Mursion</b> Jordan Don</p> <p><b>Lake Mead Assignment</b> Paul Anderson, thewonderofscience.com<sup>1</sup></p>	<p><b>Avatar(s) &amp; Environment</b></p> <p><b>Host Avatar(s)</b> Nina/Michael</p> <p><b>Simulation Avatars</b> Savannah, Dev, Ava, Jasmine, Ethan</p> <p><b>Environment [ML3z]</b> Middle School Classroom</p>	<p><b>Suggested Learner Audience</b></p> <ul style="list-style-type: none"><li>• Pre-service teachers</li></ul>
<p><b>Delivery Mode(s) Available for Scheduling</b> 1:1, Facilitated Group</p>		
<p>This scenario was created in partnership with AACTE and the convening, Enhancing Science Education through Virtual Reality: A Conference to Design Simulations that Enhance the Clinical Preparation of Secondary Science Teachers, is funded by the National Science Foundation (NSF) 20-572 Discovery Research PreK-12, award #2040747.</p>		

### Learner-Facing Vignette:

You are a middle school Earth Science teacher who is having students analyze data on increasing human population and its impact on Earth's natural resources. You are using the increasing population in Las Vegas and its effect on the water levels at Lake Mead. The students were given graphs as well as photos representing the changes in water levels, population and water consumptions (see supplemental materials). The students were then assigned the following assignment:

<p><b>Is the growth of Las Vegas causing the drop in the water level of Lake Mead?</b></p>
<p>Claim</p>

<sup>1</sup> Anderson, Paul. "Las Vegas and Lake Mead." *The Wonder of Science*, 19 1 2021, <https://thewonderofscience.com/msess34#assessments>.

# Earth Science - Middle School

## Eliciting Student Thinking

Population, Water Consumption and Water Levels

Scenario Guide

Activation Date:

Intensity Level: Low

Evidence
Reasoning

The students were instructed to use the images and graphs (see supplemental materials) to make a claim, provide evidence and explain their reasoning. The students completed their assignment and have all their materials accessible on their tablet. You have not seen their completed work yet and instead want to elicit their answers and thinking on their constructed claims before collecting their work. The focus here is not necessarily to change their mind or correct any misconceptions but rather to get a clear understanding of how each student approached the assignment.

### Outcome:

Your goal in this scenario is to elicit thinking from all students to get a clear understanding of how they constructed their claim, evidence and reasoning.

### Strategies/Best practices to consider:

- Use probing questions to elicit student thinking on their claim and how the evidence they are using supports their claim
- Encourage students to evaluate the quality of their data and limitations in the data
- Encourage students to draw on outside knowledge to support or challenge their claims and evidence based reasoning

### Information about Intensity Level: Low

### Supplemental Materials:

This scenario is gearing toward practicing the following of the [Next Generation Science Standards 8 Practices of Science & Engineering](#):<sup>2</sup>

#### Analyzing and Interpreting Data

Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools—including tabulation, graphical interpretation, visualization, and statistical analysis—to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results. Modern technology makes the collection of large data sets much easier, providing secondary sources for analysis.

<sup>2</sup> NSTA, and using information from Appendix F of the Next Generation Science Standards © 2011, 2012, 2013 Achieve, Inc. "Science and Engineering Practices." *National Science Teaching Association*, 2014, <https://ngss.nsta.org/practicesfull.aspx>. Accessed 10 8 2021.

#### Engaging in Argument from Evidence

Argumentation is the process by which explanations and solutions are reached.

#### Obtaining, Evaluating, and Communicating Information

Scientists and engineers must be able to communicate clearly and persuasively the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity.

#### Information for Course Instructor Scenario Selection:

This lesson utilizes the following Next Generation Science Standards listed below:<sup>3</sup>

#### ESS3.C: Human Impacts on Earth Systems

- Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.

### Student Prior Knowledge

Students have an understanding of the definitions of claim, evidence and reasoning.

**Claim:** a statement that answers the question. It will usually only be one sentence in length. The claim does not include any explanation, reasoning, or evidence so it should not include any transition words such as “because.”

**Evidence:** the data used to support the claim. It can be either quantitative or qualitative depending on the question and/or lab. Students should only use data within their evidence that directly supports the claim.

**Reasoning:** The explanation of “why and how” the evidence supports the claim. It should include an explanation of the underlying science concept that produced the evidence or data.

Source<sup>4</sup>

Students have varying understandings and comfortability analyzing graphs.

<sup>3</sup> Achieve. “Next Generation Science Standards.” *Next Gen Science*, 2013, <https://www.nextgenscience.org>. Accessed 10 July 2021.

<sup>4</sup> ModelTeaching. “Claim-Evidence-Reasoning (CER).” *Model Teaching*, 19 Jan 2019, <https://www.modelteaching.com/education-articles/writing-instruction/claim-evidence-reasoning-cer>.