Biology - High School
Leading Group Discussion

Thinking critically about a Scientific Article

Scenario Guide
Activation Date:
Intensity Level: Low

Author(s)	Avatar(s) & Environment	Suggested Learner Audience
Simulations for Secondary Science Teachers Conference Karri Blalock Dr. Kabba Colley Dr. Rebecca Cooper Dr. Samantha Strachan Deiny Toss **Representing AACTE:** Dr. Rachel Karchmer-Klein **Mursion** Julie Snyder	**Host Avatar(s)** Nina/Michael **Simulation Avatars** Ciara, Angela, Jordan, James, Stephanie **Environment [ML3z]** 11th Grade High School Classroom	• Pre-Service/In-Service High School Science Teachers

Delivery Mode(s) Available for Scheduling
1:1, Facilitated Group

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.

Learner-Facing Vignette:

You are a High School Biology teacher about to lead a group discussion with your 11th grade students about an article that you shared with your students for homework. This is the culmination of a unit on Healthy ecosystems/recognizing a healthy ecosystem. The students are familiar with indicators of a healthy ecosystem.

They have read the article and are prepared to have a conversation based on your guidance.You plan to lead a discussion about reading a scientific article and analyzing data. You anticipate that you will encounter some misconceptions and preconceived notions in this discussion and you plan to guide your students to have an active role in analyzing and interpreting this information.

Note: The article (as well as the Journal article upon which it is based) can be accessed via the Portal as an attachment to the scenario card.

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Outcome:
Your goal in this scenario is to engage the students in a discussion to think critically about a scientific article.

Strategies/Best practices to consider:
- Leading the students to guide their own discussion by encouraging them to respond directly to each other
- Ask follow up questions for clarification and based on concepts/misunderstandings that you uncover.
- Ask higher-order thinking questions to engage the students critically on the topic

Information about Intensity Level: Low
- Low intensity sessions are meant to build confidence for the learner. This setting is recommended for first time learners.

Supplemental Materials:
Note to the Course Instructor: Although this is a Low intensity scenario it does contain advanced content. We recommend this selecting scenario for Learners that have had experience with Mursion simulations and/or experience in the field.

Students Prior Knowledge:
Indicators of a Healthy Ecosystem

This scenario is gearing toward practicing the following of the Next Generation Science Standards 8 Practices of Science & Engineering:[1]

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.
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.

[1] 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.

Mursion_AACTE/NSF_HS_Leading Group Discussion-Biology

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Background (Internal, not Learner-Facing)

Review Time	Delivery Mode(s)
Advanced Mursion Bank: Up to 15 minutes: bill Trainee directly to client	1:1, Facilitated Group

Scenario Specific Content

Intensity Level:

- **Low:** In a low intensity, the students exhibit mostly on task behavior with a few instances of off task behavior. Most students are engaged and off-task behavior is likely a result of over-participation or excitement over the subject matter. Off-task behavior can be redirected at the first attempt by the Learner.

Host Specific Inquiries:

- N/A

What is this scenario intended to address?

This scenario provides the experience of leading a group discussion in a high school classroom.

Simulation Specialist Goal:

To provide learners with opportunities to lead a group discussion and encourage participation from all students.

Avatar's perspective:

This is the culmination of a unit on Healthy ecosystems/recognizing a healthy ecosystem. You have discussed pesticides with your students and they are also familiar with indicators of a healthy ecosystem. Students also understand how to navigate the digital text.

Prior Knowledge

This is the culmination of a unit on Healthy ecosystems; your students are familiar with indicators of a healthy ecosystem.

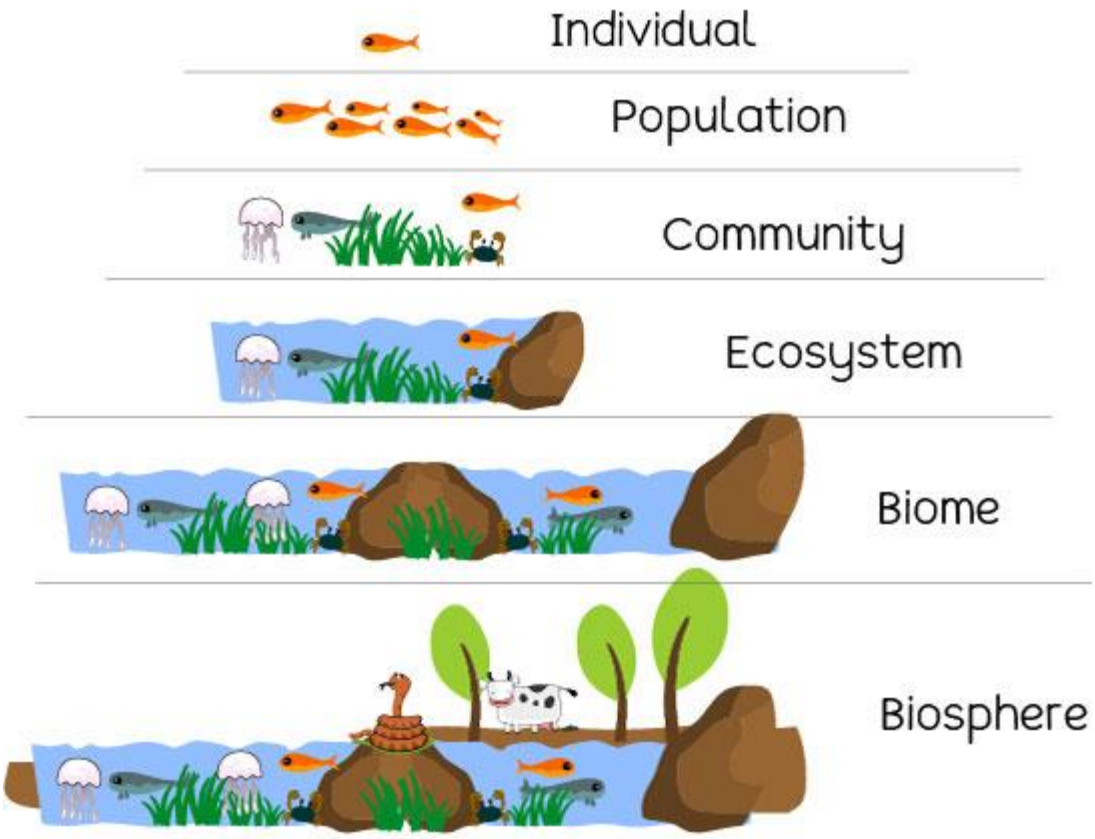
- How pesticides affect the environment/the stability of the ecosystem. Can contaminate soil, water, turf, and other vegetation. In addition to killing insects or weeds, pesticides can be toxic to a host of other organisms including birds, fish, beneficial insects, and non-target plants.

- Indicators of a healthy ecosystem: Measures which help us to understand where action should be taken to restore ecosystem health and associated benefits

  Productivity: the rate of biomass production. Productivity in ecosystems is of two kinds, i.e., primary and secondary. Green plants fix solar energy and accumulate it in organic forms as chemical energy. As this is the first and basic form of energy storage, the rate at which the energy accumulates in the green plants or producers is known as primary productivity.

  Resilience: Ability of an ecosystem to maintain its normal patterns of nutrient cycling and biomass production after being subjected to damage caused by an ecological disturbance.

  Organization (including biodiversity): Levels of belonging in an ecosystem.



- The food web: the food chains in the ecosystem. If something is removed from the food chain
- Amount of biodiversity: ie. variety of life in the world or in a particular habitat/ecosystem

  (From article): variety of life in the world or in a particular habitat or ecosystem. To increase biodiversity in a garden, plant different trees, shrubs, and flowers.
- No plastic in the ocean/lakes/rivers, no litter on the side of the street

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Is this a legitimate article/how do you know?		
• At the end of the article you can click on the link to see the real version and at the top of the page it has a note that it's peer reviewed.	• It doesn't say in the article but if you clink on the link to the Journal website it says at the top "cutting edge peer reviewed"	• No, legit articles wouldn't have pictures and graphic design
What is the article actually about?		
• Voles are evolving toward a smaller body size as a result of environmental influences. (Young voles with genes for small bodies developed faster This allowed them to survive better when environmental conditions changes) • The article is about adaptive evolution and the researchers used this theory of adaptive evolution to understand changes over time in snow voles.	• Surface Level: Evolution/Voles • Vole sizes	• Voles are still big in the end so no evolution. • If voles are average then they did not evolve (misconception that evolution occurs at the individual level). •
What is the Claim? Statement that asserts a point, belief, or truth requires supporting evidence. Identify what the author is trying to tell the audience in the article.		
• Voles are small because smaller voles develop faster which is favorable to their environment.	• Smaller voles do better in the environment.	• Smaller bodies do not fare well in the cold.
What is the Evidence? Information, facts or data supporting (or contradicting) a claim, assumption or hypothesis		
• The study shows that populations evolve rapidly when we look at species genetics. • Researchers used a mathematical model to study the contributing factors to the voles evolution. Data illustrated the claims.	• The voles are evolving to a smaller genotype, but still have a larger phenotype because there is a lot to eat.	• Average body size was the same throughout the study.
What is the Reasoning?		

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A problem-solving process that involves critical thinking in relation to content, procedural, and epistemic knowledge.		
• The reason Voles develop faster is because evolution has changed genetics since smaller bodies are favorable to survive in the alpine habitat.	• The bigger Voles didn't survive so they stopped growing bigger since it's safer for them to be small.	• Since the body size was the same then average size voles are born.
What is the hypothesis: A tentative, testable answer to a scientific question		
• The population is not really evolving. • Adaptation is not happening, but the genetic changes are swamped out by environmental changes.	• The population is not really evolving because adaptation is happening, smaller voles survive longer than larger voles.	• The population is evolving. • There is no evolution because they are about the same weight.
What is the Purpose:		
• Why don't we see the average snow vole within the population evolving to be larger?	• Study the genotypes of a population of Voles to find if size is the cause of fitness.	• Finding Vole sizes

Potential Questions	
What journal was it published in/who is the author?	Environmental Science Journal for Teens by Timothee Bonnet, Peter Wandeler, Glauco Camenish, Erik Postma
What was the method of study used?	The research team trapped and marked voles every summer to collect their measurements and DNA.
What were the results?	Larger body size did not help with fitness, but they did survive and reproduce.
What were the conclusions?	Adaptive evolution can help species with the dramatic change of the environment.

Potential Misconceptions/Pushbacks:

- Students have the misconception that charts/tables are not necessary. "I didn't look at that I just read the article"
- Students just read the abstract (intro & conclusion/skimming like they do on social media) and think they know what the article is about.
- Not reading the glossary to understand words in context
- Not all of the students will be interested in the subject matter
- This doesn't apply to us… nothing is impacted by this.

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- Qualitative vs. Quantitative (particularly in regards to the body size of the vole)
- Evolution: interpretation that individuals evolve vs. the sciences that it is populations evolving.

Pushback Techniques:

- N/A this is a Low intensity scenario

Sim Specific Information:
N/A