Classroom Teacher Preparation

Life Science 10: Sustainability - Fishing for Answers

Please use the following to prepare for the next SfS lesson.

Description:

This lesson uses a fishing game to explore the concepts of sustainability and the tragedy of the commons. Initially, students play a round of the game with no communication allowed. Once most "villages" run out of fish, groups get a chance to collaborate to devise strategies that will allow them to fish sustainably. After the activity, students present their individual group strategies and the class chooses a strategy that will allow them to continue to fish indefinitely.

Lesson Objectives – SWBAT ("Students Will Be Able To…"):

3rd-8th

- Describe the concepts of sustainability and the Tragedy of the Commons
- Theorize and test possible ways to prevent a Tragedy of the Commons

Disciplinary Core Idea (DCI)

ESS3 Earth and Human Activity - ESS3.C Human impacts on Earth systems

- (3rd-5th) Societal activities have had major effects on the land, ocean, atmosphere, and even outer space. Societal activities can also help protect Earth's resources and environments.
- (6th-8th) Human activities have altered the biosphere, sometimes damaging it, although changes to environments can have different impacts for different living things. Activities and technologies can be engineered to reduce people's impacts on Earth

Science & Engineering Practice (SEP)

Constructing Explanations and Designing Solutions

- (3rd-5th) Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.
- (6th-8th) Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Analyzing and Interpreting Data (If students collect and analyze graphed data)

- (3rd-5th) Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.
- (6th-8th) Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships.

Crosscutting Concept (CCC)

Cause and Effect

- (3rd-5th) Cause and effect relationships are routinely identified, tested, and used to explain change.
- (6th-8th) Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Stability and Change (*If students collect and analyze graphed data)*

- (3^{rd}-5^{th}) Some systems appear stable, but over long periods of time will eventually change.
- (6^{th}-8^{th}) Stability might be disturbed either by sudden events or gradual changes that accumulate over time

Preparation:

This lesson is an introduction to the concepts of sustainability and the Tragedy of the Commons.

Room Set Up for Activities:

Students will work in groups of 4-6. They will need space to surround a plate such that each group member has equal access to the plate with a pair of chopsticks. In some classes, groups may combine, in which case there will need to be space for 8-12 students to surround 1-2 plates. In that case, the plates can be spaced on adjacent tables if necessary.

Safety:

There are no safety issues with this lesson.

Related Modules

This lesson may be taught as part of a sequence or group of related modules on **Human Impact.** Modules include:

Life Science 5: Food Webs - This module teaches the basics of food webs. Students first construct a food web model for a simplified Yellowstone ecosystem. They then consider what would happen to the ecosystem if the food web were disrupted by the removal of a native species and/or the introduction of an invasive species.

Engineering 6: Saving the Beach – Examines the causes of beach erosion and discuss how erosion affects a beach and its 'stakeholders'. Students work in small groups to engineer solutions to beach erosion through brainstorming, planning, and designing prototypes for their model beaches.

Technology 5: E-trashing our Future – Students get an opportunity to examine the increasing volume of e-waste in society and how our country is dealing with our technology habits.

Earth Science 1: Oil Spill – Students explore the issues surrounding an oil spill, particularly the methods of environmental cleanup as they act as environmental engineers to test different methods for effectively cleaning up a model oil spill.

For other module sequences and groups, look here: www.sciencefromscientists.org/sequences

Standards Covered:

Please click the following link to our website to review the standards covered by this lesson, listed by state: www.sciencefromscientists.org/standards/

Lessons are matched to both national NGSS and local state standards.

After Our Visit:

The extension activity provides a similar version of our in-class fishing game but online (with some different parameters).

Access this Extension activity by visiting the Classroom Post found on our website at sciencefromscientists.org/cohorts. Use the name of your school/cohort and password to log in.

To help Evaluate, check out our Open Response questions online at sciencefromscientists.org/open-response-questions. They are freely available for all of our lessons for current teachers. Use the password supplied by your instructor to log in.

Additional Resources:

- Lesson plan for another version of this activity: http://www.pbs.org/emptyoceans/educators/activities/fishing-for-the-Future.html
- Interview with a "Sustainability Engineer" (7:04): https://mass.pbslearningmedia.org/resource/969365ae-3a35-453a-9a01-436336e944df/sustainability-engineering/#.WygV-CAnZPY
- TedEd Tragedy of the Commons (4:58): https://www.youtube.com/watch?v=CxC161GvMPc
- YouTube video by *This Place* describing the Tragedy of the Commons (3:26): https://www.youtube.com/watch?v=WYA1y405JW0