Ánimo Leadership Charter High School 2011 QuikSCience Team

Lesson Plan: The Benefits of Deep Sea Microbes

Title: The Biology of Deep Sea Microbes

Grade Level: 9
Subject: The benefits of Deep Sea Microbes
Duration: 50 minutes
Group Size: 20-30 students
Number of Classes: 6

Introduction: The purpose of this project is to show how microbes benefit us. We will demonstrate this with deep sea microbes specially the oil-eating microbe known as *alcinivorax borkumensis*. The potential of deep sea microbes is greater than any other microorganism due to their extreme environment. This potential can in turn solve humanity's problems far more easily than conventional means.

Setting the Scene: When students are listening to our presentation, they will process the information and be intrigued by our topic. They will be given an assignment sometime before the presentation so they will gain some knowledge of what microbes are preferably, deep sea microbes.

Brainteaser: Students will go into groups and will make a list of 5 microbes. Describe what a person will look like if all of their cells were removed. The result would be a perfect outline of that same person made entirely out of microbes.

Hook: Examples of deep sea microbes;

Learning Objective: Students will understand how microbes can beneficial to mankind.

Technology: PowerPoint and projector.

Student Presentation: The importance of deep sea microbes.
We will demonstrate how deep sea microbes connect to the nitrogen cycle which affects all of the ecosystems and life. We will also explain how they are the primary reason for life at these depths.

Activity Before Concept:

- Activity Objective

Students will be given an explanation of how these microbes can be of great importance to mankind with examples of microbes that have assisted man.

- Students will take a pre-quiz to see how much they are familiar with microbes.

This will provide a base in which we will build on and correct any wrong ideas that they might have about microbes.

- The students will receive an assignment which involves them getting research on a microbe of their choice from adopamicrobe.com. The assignment will be 2 paragraphs all with information pertaining to that microbe in terms of what it does, its affect, and when was it discovered, etc.

Phase One: Introduction to the Presentation:

- We, as the members of QuikScience team will introduce the activity for the students. We will begin with a presentation of microbes and a small history behind them. Once this concept is understood, we will give them an activity based on what we have covered.

Second Activity:

- We will present to them the bacteria *alcinivorax borkumensis* by showing them a video of how this microbe was used in the BC oil spill.

Student Practice: Activity

- Students will have to do a cut activity that involves sorting pictures of deep sea microbes and diseases into their respective categories. With the diseases they will have to separate them into either where they originated, the symptoms, or how they spread.

Closure:

We will answer any questions students they may have to the best of our abilities. The material taught will be based on the presentation and activities done by the QuikScience members. Our quiz will reflect our success, or lack it, in educating the students about the issue and what they can do to help.

Independent Practice: Reflection

Since we want the students to seriously think about this subject, we will give them an assignment to further their knowledge. We will give them the assignment of writing a 3 paragraph essay on how the microbe they have adopted has benefited or harmed mankind. They will present their microbe later in the week. This will make them think about how microbes really affect our world. This will make them think of why microbes are such a big deal

Continuation: Even with the presentation completed, the work for the students is not done. In order to ensure that they have learned these concepts they will take a test that will be a part of their grade. This test will include most of the concepts that was mentioned in the presentation.

Ecology

6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept: a. Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats. b. Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.

c. Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.
d. Students know how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.
e. Students know a vital part of an ecosystem is the stability of its producers and decomposers.
f. Students know at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.
g.* Students know how to distinguish between the accommodation of an individual organism to its environment and the gradual adaptation of a lineage of organisms through genetic change.

Evolution

7. The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept: a. Students know why natural selection acts on the phenotype rather than the genotype of an organism.
b. Students know why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.
c. Students know new mutations are constantly being generated in a gene pool. d. Students know variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.
e.* Students know the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature. f.* Students know how to solve the Hardy-Weinberg equation to predict the frequency of genotypes in a population, given the frequency of phenotypes.
8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept: a. Students know how natural selection determines the differential survival of groups of organisms.
b. Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment. c. Students know the effects of genetic drift on the diversity of organisms in a population.
d. Students know reproductive or geographic isolation affects speciation.
e. Students know how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction. f.* Students know how to use comparative embryology, DNA or protein sequence comparisons, and other independent sources of data to create a branching diagram (cladogram) that shows probable evolutionary relationships.
g.* Students know how several independent molecular clocks, calibrated against each other and combined with evidence from the fossil record, can help to estimate how long ago various groups of organisms diverged evolutionarily from one another.