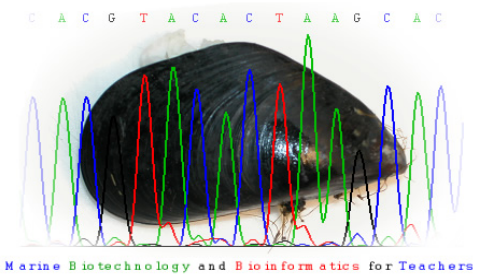

PHYSIOLOGICAL ADAPTATIONS AND MOLECULAR ECOLOGY

Title of Lesson: Physiological Adaptations and Molecular Ecology

Designed by:

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Background:

Students will visit the Upper Newport Bay Estuary and study the ecology of the area—the different physiological adaptations of the plants and animals in the six habitats, the impact that invasive species have on the native species, and current population and molecular ecology research. Students will sample native and invasive sea snail populations using transects and interpret the data found. Biochemical adaptations versus morphological adaptations (external anatomy) will then be discussed (i.e. how related different species of animals are is based on DNA not morphological similarities. How would you tell where the source population is, and if it is introduced? The question of the ice plant and how one would find out where the plant came from and when. (this is exactly what we did with the mussels in the biotechnology workshop—ice plant is native to S. Africa and then went to Chile, and then to California at about the time the Spanish arrived but there may be multiple introductions)

Description of Audience:

Middle school students (grades 6-8) from varied economic and ethnic backgrounds

State Standards:

Evolution

Biological evolution accounts for the diversity of species developed through gradual processes over many generations. As a basis for understanding this concept:

1. *Students know* both genetic variation and environmental factors are causes of evolution and diversity of organisms.
2. *Students know* the reasoning used by Charles Darwin in reaching his conclusion that natural selection is the mechanism of evolution.
3. *Students know* how independent lines of evidence from geology, fossils, and comparative anatomy provide the bases for the theory of evolution.

Genetics

A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. As a basis for understanding this concept:

1. *Students know* sexual reproduction produces offspring that inherit half their genes from each parent.
2. *Students know* an inherited trait can be determined by one or more genes.
3. *Students know* DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.

Investigation and Experimentation

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:

1. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.
2. Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project.
3. Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence.
4. Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure).
5. Communicate the steps and results from an investigation in written reports and oral presentations.

National Standards:

STEM Connection:

Environmental consultant, government, university, and private researcher, preserve/ park management, and environmental educator

Goals(s):

The goal of this lesson is to (List overall goals. What do YOU, as the teacher, set up for students to learn?):

1. Conduct scientific field research and how biotechnology can be applied.
2. Understand and appreciate the complexity of an ecosystem and how organisms are physiologically adapted to it.

Learning Objective(s):

Upon completion of this lesson, students will be able to (Include process skills but be specific. What will the STUDENTS be able to do/demonstrate as a result of this lesson?):

1. How related different species of organisms are is based on DNA not morphological similarities. (Molecular basis of heredity)
2. How organisms have physical adaptations that allow them to survive in their habitat.
3. The impact of invasive species on an ecosystem (and the native species).
4. How to do research--scientific process in an investigation/ study.
5. How one would use biotechnology to answer an ecological question. (iceplant)

Purpose/Rationale:

Research is the basis for science. A student should conduct their own research in order to understand and appreciate other science research.

Materials/Resources:

Transect lines, quadrants, random number lists & Newport Backbay

3-Step Procedure:

#1 Introduction:

- background of the ecology of the backbay

#2 Exploration:

- transect and quadrant sampling

#3 Application:

- analyze the research and discuss how it and other research can answer questions and increase human understanding

Assessment:

- Students will write in a journal about what was learned and students will share this in groups.

Teachers' Self Evaluation:

- *Incomplete*