



Education and Research: Testing Hypotheses

Lesson Plan—Appearances are Deceiving

Summary

This lesson is intended to introduce students to selection processes that govern convergent evolution. Students will focus on analogous physical and behavioral characteristics of organisms that are found in the deep ocean and how these characteristics are adaptive to this environment. Additionally students will discuss the analogous nature of the chemicals that produce bioluminescence and suggest hypotheses on how and why these chemicals are used. Corollaries to terrestrial and cave ecosystems shall also be discussed.

Key Concepts

- Natural selection and its evolutionary consequences provide a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms.
- Organisms evolve due to selective pressures from the environment.
- Adaptations provide a selective advantage to individuals of a population that aid in their survival in a specific environment.
- Due to the constant factors that are found in the deep ocean (lack of light, cold temperatures, salinity, etc.) organisms evolve strategies that enable them to survive in that habitat.
- Convergent evolution is a process in which organisms from different biological backgrounds evolve similar strategies (physiological, morphological, and behavioral) to survive.

Objectives

Students will be able to:

- **Differentiate between** divergent and convergent evolution
- **Identify** and **classify** the organisms observed that are found in the deep ocean
- **Identify** morphological characteristics and behavioral characteristics of organisms in the deep ocean environment
- **Evaluate** common characteristics among different classes of deep ocean organisms
- **Predict** if the adaptations observed are due to divergent or convergent evolution

Materials

- Computers with Internet access
- *Eye In the Sea* video clips downloaded onto computers, or broadband access to the EARTH Website and Flash Media Player

- Copies of worksheets for each student
 - Web Lab Activity: *Monsters of the Deep*
 - Associated worksheets 1, 2, & 3
 - Video Data Sheet
 - EITS Observations
 - Analysis Questions

Procedure

1. Discuss the patterns of evolution in order to differentiate between divergent and convergent evolution.
2. Form groups of students based on the number of available computers (2–4 students per group is ideal)
3. Students should go to the [Monsters of the Deep](http://www.seasky.org/monsters/sea7a.html) Web site (<http://www.seasky.org/monsters/sea7a.html>) to observe some of the creatures found in the deep ocean environment.
 - Using the worksheet “*Web Lab Activity: Monsters of the Deep*,” students should list the adaptations for each organism that have contributed to the organism’s success in the deep sea
4. Assign each student or student group a video clip of marine organisms responding to the *Eye In The Sea* probe.
 - While viewing the video, have students complete the Video Data Sheet.
 - Students should view the video clip several times to obtain accurate observations.
 - Background information for fish morphology can be found on the “[Observing Deeply](#)” lesson page
 - After completing this activity, students should evaluate their observations by answering the questions in the worksheet “*Eye in the Sea Observations*.”
5. Have students complete the worksheet “*Analysis Questions*,” either individually or in groups.
6. Have students build a concept map of the major concepts of this lesson.

Assessment

- **Performance**—Did student participate in discussion and demonstrate an understanding of the differences between divergent and convergent evolution? Did students actively participate in the collaboration and help their partners to find and understand information about identification and classification of deep ocean organisms, identify morphological and behavior characteristics of deep ocean organisms, evaluate common characteristics among different classes of deep ocean organisms, and predict if adaptations of deep ocean organisms are due to divergent or convergent evolution?
- **Product**—Did student’s concept map show an understanding of adaptations and convergent evolution of organisms in the deep ocean environment?