PROJECT O*CEANOLOGY*

Tree of Life

Overview

In this hands-on exercise, students closely observe a diverse set of marine organisms and then work together in small groups to construct models (phylogenetic trees) that predict evolutionary relationships between the organisms.

Tree of Life Lesson: Protocol & Teaching Notes

Engage: Tree of Life slideshow/quiz with discussion.

- *Show of hands – which is most closely related? How did they know?*
- *Students likely looked for similarities and assumed that similar organisms were more closely related. Is this always/often a safe assumption?*
- *Students likely made judgments about which traits were most important. Some traits are more informative than others?*

Explore:

1. Critter bins – students circulate in small groups, checking out the organisms and taking notes on key structures, behaviors, etc.
2. Meet in small groups to brainstorm a list of characters that they think will be important for classifying the organisms. *Go over the definition of character, discuss what makes a good character.*
3. Fill in the character matrix table on the worksheet.
   Walk around the room helping students with this.

Explain: Brief lecture on phylogenetic trees and tree thinking. Phylogenetic trees as hypotheses for evolution, outgroups, evolutionary relatedness, shared ancestors, how to map traits (categories of characters) onto trees. Go through a food phylogeny example slide show and discuss which types of characters are most useful for learning about relatedness (e.g. permanent traits, not subjective).

Elaborate: Students may want to revise their character matrix using what they have just learned, so allow time for this. Next, students should use their character matrix tables to build a phylogenetic tree of the organisms they observed. Draw trees on board or on large sheets of paper.
Emphasize that they are building models- these are hypotheses about evolution

Evaluate: Students present their trees to each other. Discussion of similarities/differences between trees, and why.
Were there any commonalities? Can they come to consensus?
How can scientists working with the same set of organisms come up with different phylogenetic trees?

Optional Post-Lab Assignments

Tree of Life Homework sheet

Example phylogeny with set of questions designed to reinforce major concepts

Build an Ancestor

Students pick a node on their phylogeny, and use their new phylogenetic tree skills to predict what traits (categories of characters) might be present in the common ancestor at that node. Students draw a picture of the hypothetical ancestor, labeling the relevant traits.