Project *Oceanology*

Adaptation & Resource Limitation

Overview:

In this activity, students explore two important concepts in ecology and evolution: **adaptations** and **resource limitation**.

In the first activity, students will compare the effectiveness of different foraging (food finding) behaviors. They will learn that adaptations are characteristics of organisms that help them survive and reproduce. Although most students think first of structures - physical traits of organisms – behaviors can be adaptations as well. Students will decide based on their experiences which of the foraging behaviors from the activity are the most adaptive.

In the second activity, students will repeat their study under a different set of environmental conditions (resource limitation). They will find that when animals are competing for a resource, adaptations are even more important.

Materials Needed:

1. Large bag of items: beads, shells, markers, legos, or other small objects that can be used as 'food'. Should be easy to pick up from the floor.
2. Paper cups or similar to hold foraged items (one per student)
3. Blindfolds (optional)
4. Slips of paper assigning foraging strategies (below)

Ahead of Class:

1. Prepare two bags of items: one with only 3-4 items per student, and one with many (>10) per student.
2. Print out foraging strategies and cut into slips of paper, so that students can draw a strategy out of a hat.

Activity 1: Foraging Adaptations

1. Introduce **Adaptation: an inherited trait of an organism that helps it survive and reproduce in its environment.**
    a. Ask for examples of adaptations. Can narrow the focus here and give an example organism (squirrel, fish, etc).
    b. Point out that adaptations can be physical traits OR behaviors. If students have given examples of each, categorize. If not, ask for examples of adaptive behaviors.
2. Students draw foraging strategies out of a hat. Give each student a paper cup and have them stand in a circle.
3. Explain that:
    a. They will be foraging for food, represented by the items. They must use their assigned foraging strategy.
    b. They must collect food until they have 10 items in their cup – at this point they are no longer hungry (satiation)
4. Empty the larger of the bags of items onto the floor in the middle of the circle and tell them 'begin!'

All students should eventually finish by foraging 10 items. Pay attention to which students finish first; take notes

5. Group discussion:
    a. Which strategies worked best?
    b. Which were less successful?
    c. Give an example of an adaptation from this activity*:*

ans: a successful foraging behavior

    d. Did anyone fail to get enough food? *(no)*
    e. Does this mean that foraging strategy doesn't matter/isn't important?

Many responses possible. Students may argue that it isn't important because all students got enough food. Others may point out that if organisms have to spend more time foraging for food, they might have less time or energy for other things like reproduction, resting, finding shelter, hiding from predators, etc.

6. Students help pick up any remaining items and return them to the bag

Activity 2: Effect of resource limitation on foraging success

1. Students stand in a circle again. Tell them we will repeat the activity, but this time there will be fewer items – in other words, food will be a limiting resource.
2. Redistribute foraging strategies (or not – teachers choice)
3. Remind students that they must use their assigned strategy, and should stop if/when they have collected 10 items.
4. Empty the smaller bag of items (with only 2-3 per student) onto the floor in the middle of the circle and tell them 'begin!'
5. Wait until all items have been foraged.
6. Group Discussion:
    a. Did any students collect 10 items (reach satiation?).
    b. Which students were the most successful?
    c. When resources were limiting, was foraging strategy more important? *(yes).*

Follow-up Assignment: Resource Limitation

In-class or as homework

In the activity that you just completed with your classmates, you were organisms competing for food. Now, consider how organisms might compete for other limited resources. Choose one of the following two scenarios, circle it, and then answer the questions below.

Resource Limitation Scenarios:

A. Sea gulls competing for the best nesting sites on a small island

B. Male crickets competing for the attention of female crickets

Discussion Questions:

1. In the scenario you chose, what is the limiting resource?_____

Sea gulls: nest sites
Crickets: mates

2. Describe a trait or characteristic that might help the organism you chose compete successfully:

3. Is the trait you chose an adaptation? Why or why not?

Most traits that help an organism survive or reproduce are adaptations, as long as they are heritable.

4. Imagine that the resource is NOT limiting (enough nest sites to go around, or enough female crickets that every male can find a mate). Would the trait you described still be an adaptation? Why or why not?

No one right answer; students could make a reasonable argument either way

Foraging Strategies

Print one copy of this page for every 10 students

Foraging Strategy: One Handed Picker
- Pick up one item at a time
- May only use one hand to pick up (the other can hold the cup)

Foraging Strategy: Two Handed Picker
- Each hand can pick up one item at a time
- Can use both hands

Foraging Strategy: The Hopper
- Feet must stay together at all times
- Can move by hopping
- Each hand can pick up one item at a time
- Can use both hands

Foraging Strategy: Blind Picker
- Must keep eyes closed/be blindfolded
- Each hand can pick up one item at a time
- Can use both hands

Foraging Strategy: Backwards Picker
- Can only pick items behind your back
- OK to look over shoulder
- Each hand can pick up one item at a time
- Can use both hands

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