
Lesson 2: Explore

Big Idea: Organisms that are best suited for their environment survive and reproduce. Organisms that are least suited for their environment rarely survive long enough to pass on their favorable traits through reproduction.

Lesson Objective: Students will design and evaluate an “organism” that will maximize the mass of food gathered.

Lesson Essential Question: How well suited is your organism for its environment?

Materials Needed: Upcycled materials
Binding materials (tape, glue)
Electronic Balance
Chart paper/butcher paper (or Google drive)
Cups

Vocabulary: engineering design process, trait, favorable, advantage, mass, average

Lesson Flow:

1. Brainstorm: (Engage)

- a. Teacher poses the question “*What are the different ways birds gather food?*”
- b. Students answer using prior knowledge.
 - i. Possible student answers include: scooping, grabbing, scavenging, etc.
- c. Teacher shows videos of different ways birds gather food.
 - i. Pelicans scooping fish out of the ocean
 - ii. Crows dropping snails to crack them open
 - iii. Woodpeckers pulling grubs out of a tree
 - iv. Finch cracking a nut open with it’s beak
 - v. Toucan pulling fruit out with it’s tongue
- d. Short class discussion on different food gathering techniques.

2. Organism Creation Using the Engineering Design Process (Explore)

- a. Teacher introduces the task:
 - i. Students (in groups) must design and build an “organism” that will gather at least 5g of food from its environment.
- b. Student groups receive their environments and brainstorm best techniques for collecting the food sources. Students record their brainstorm on their worksheet.
- c. Teacher introduces the materials that can be used to create their organism and the criteria for the organism.
 - i. Must use at least 2 different base materials.
 - ii. Must have a moveable part
 - iii. Cannot use more than 5 different base materials.

- d. Student groups brainstorm possible designs. Students must draw an initial design and have it approved by the teacher before receiving materials.
- e. Students will build and test their designs. Students can redesign as many times as needed during the allotted “design time”. Students should be encouraged to conserve materials, and redesign using existing materials or trade materials.
 - i. Students must record revisions made to their “organism” and provide reasoning for those revisions on their worksheets.

3. Class-wide Test (Explain)

- a. At the end of the allotted design time, teacher has all creation stop. Student then test their designs in final test.
 - i. Students get 2 minutes in their environment to collect as much food mass as they can and record their data in a data table.
 - ii. Students perform three trials, and take the average.
- b. Students will identify the favorable and least favorable traits for their environment.
- c. Teacher explains that if the students’ organism’s average food mass is above 5g then the organism survives and reproduces. If the organism’s average food mass is below 5g the organism dies before it can reproduce and pass on traits.
- d. Students will record the data and traits on a class spreadsheet for further analysis.
- e. Students will explain how the favorable traits allowed their organism to survive. Or why the least favorable traits caused their organism to die.

4. Class-wide Data Analysis (Extend)

- a. Students look at the class-wide data to determine the best 2 traits for each environment, and use the mass data to justify why those traits are the most favorable.
- b. Students will predict if their organism would have survived in the other environments and justify their prediction using evidence.

5. Thinking Toward The Future (Evaluate)

- a. Teacher poses the question *“If you were to receive an environment with all 4 food sources in it, how would you redesign your organism so that it will survive?”*