Lesson 3: Explore

Big Idea: Populations with greater genetic diversity have a higher probability of survival than populations with low genetic diversity.

Lesson Objective: Students will redesign their organism from an assigned list of favorable traits. Students will justify why having a larger list of favorable traits increases the organism's probability of survival.

Lesson Essential Question: Is it better for a population to have more favorable traits than less favorable traits?

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

Vocabulary:

Lesson Flow:

1. **Connections to Lesson 1: (Engage)**
    a. Teacher poses the question "*Think back to Monday's activity in which you looked at fact cards of organisms. From the first organism to today's organism, predict how much time it took for the species to change.*"
    b. Teacher elicits a small discussion on evolution and the time it takes. Emphasize that this process takes thousands of years, and this week's activities are speeding up time. Each time a minor change is made to the student's organisms, those are like "generations" of a species. 10 minor changes = 10 generations.

2. **Organism Creation Using the Engineering Design Process (Explore)**
    a. Teacher introduces the task:
        i. Students (in groups) must re-design and their "organism", using a list of favorable traits created by the class the previous day, that will gather at least 5g of food from its environment.
            1. This time though, all student groups have the same set of mixed food sources.
        ii. The list of traits will be different for each group of students. Some groups may have more favorable traits (more genetic diversity) than others.
            1. This will be different class by class, group by group - it all depends on the student analysis in Lesson 2.
    b. Teacher reminds students of 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.

c. Student groups brainstorm possible designs. Students must draw an initial design and have it approved by the teacher before receiving materials.
d. 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 groups with more favorable traits to choose from were able to survive while groups with less favorable traits to choose from were not able to survive as well/not at all.

Organism Design

Task: With your group, you must design and build an organism that will gather at least 5g of food from its environment.

Requirements: Must use at least **2** different base materials
Must have a **moveable** "mouth"
Cannot use **more than 5** different base materials

Part 1: Brainstorm

1. Describe the food source. What does it feel like? What does it look like?

2. Brainstorm with your group ways you could pickup and carry the food. Record your ideas below (does not need to be complete sentences).

3. Draw what you believe your organism will look like. Label important parts and materials you wish to use.

Part 2: Design Process

As you design and build your organism, it wont be perfect the first time. Record the modifications (changes) you make to your original design below, and provide justification why you changed what you did.

Modification	Justification

Part 3: Final Design

Drawing of Your Final Organism (label all parts)	Material List

Part 4: Group Testing and Data Analysis

Record your data from the three trials below.

Trial #	Mass of Food + Cup	Mass of Cup	Mass of Food
1			
2			
3			

Average mass of food = _____ + _____ + _____ =

3

1. Which traits (parts) of your organism helped it pickup and carry the food?

2. Which traits (parts) of your organism did not help it pickup and carry the food?

3. Was your organism able to collect enough food to survive? Why or why not?

4. Class-wide data:

Food Source	Favorable Traits	Prediction
		I predict my organism *(would/would not)* survive with this food source because
		I predict my organism *(would/would not)* survive with this food source because

		I predict my organism *(would/would not)* survive with this food source because
		I predict my organism *(would/would not)* survive with this food source because

Part 5: Organism Re-Design

Additional Traits to use:

As you re-design and build your organism, record the modifications (changes) you make to your original design below, and provide justification why you changed what you did.

Modification	Justification

Drawing of Your Final Organism (label all parts)	Material List

Part 6: Final Testing and Data Analysis

Record your data from the three trials below.

Trial #	Mass of Food + Cup	Mass of Cup	Mass of Food
1			
2			
3			

Average mass of food = _____ + _____ + _____ =
3

1. Was your organism able to collect enough food to survive? Why or why not?

2. How many *favorable traits* did your organism have?

Class Data:

Group #	Number of Favorable Traits	Survive/Not Survive
1		
2		
3		
4		
5		

3. What do you notice about the organisms that survived?

4. Did the survivors have more or less favorable traits than the non-survivors?

5. Populations with *(more / less)* favorable traits are (*more / less*) likely to survive. I believe this because