

Evolution Lesson Study: Part I

First Steps; Identifying Pre-conceptions:

Common pre-conceptions from the research base of Project 2061:

- i. Individuals develop new traits because they need them.
- ii. Environmental conditions cause changes in individuals that are then inherited.
- iii. Adaptation occurs as a conscious process to fulfill a need or want.
- iv. Individuals can develop new traits by over or under-using.
- v. All mutations in an individual's life are passed on to its offspring.
- vi. Confusion between non-inherited and inherited mutations.
- vii. Every organism reproduces equally, there are no extra organisms.
- viii. There is very little diversity.

Pre-conception identifying activities:

(20 Min.) Journal Write

Show slide of mice on islands:

- 1) -Explain why the mouse populations look the way they do.
- 2) -Explain what the mouse populations will look like in the future and why.

(20 Min.) Groups of 3-4 students white board their ideas:

(While doing this you will develop a list of "Words of Interest" [e.g. little Johnny, interesting word, please write that on the board])

- 1) Come to a consensus within the group.
- 2) Write their consensus in their journals.
- 3) Present their ideas on a poster for the gallery walk the next day.

(20 Min.) Gallery Walk & Value Vote (which one makes the "most sense"):

- 1) Each student has a value sticker and places it on which poster they believe to make the most sense.
- 2) Teacher picks the three highest ranked posters, put them up as categories along with a blank category.

(20 Min.) (Presentation):

- 1) Groups with their poster in front give a brief explanation of their poster.
- 2) "Which of those three best represents your poster? If none-develop a new category."
- 3) As these explanations are being presented to the group, write down "words of interest."
- 4) Other category will present their ideas as a group.
- 5) "Wow we have a lot of ideas that come from various places, now let's explore this topic and come to a common understanding about how this concept works".

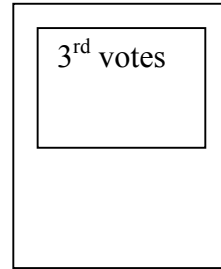
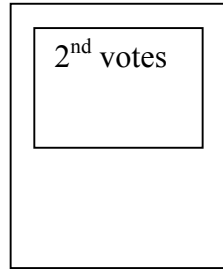
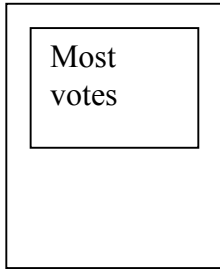
Instructions for poster gallery walk

Put up all explanation posters. (whiteboard gallery walk)

All students vote for the 2 posters that they believe have the best explanations.

The 3 posters with the most votes are selected and reviewed by the class.

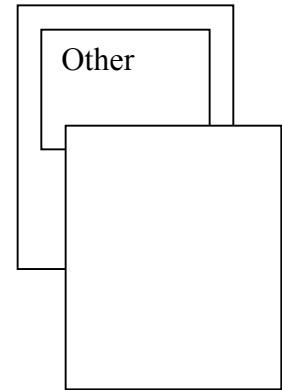
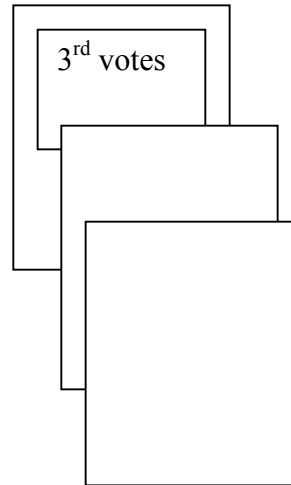
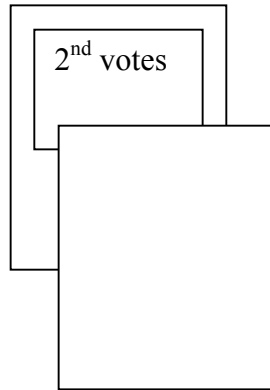
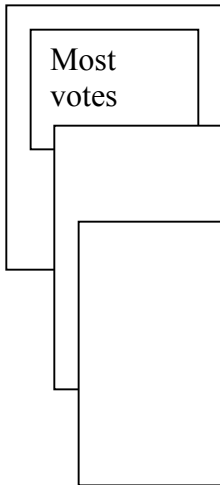
The class can agree to substitute the 4th vote getter if any of the first 3 are too similar.



The 3 groups whose posters have been selected quickly explain their posters.

The remaining groups of students put their posters with the explanation that is most similar to their own.

An additional category of “Other” is put up to accommodate any explanations that don’t fit in the 3 selected.



Ok, Let’s test these explanations with a simulation.

Evolution Lesson Study: Part II

Second Step; Introduction to how populations change.
Population Lab:

(20 Min.) Physical & hands on activity (1st Page)
“Gentle Contact Only!”

(10 Min) Data share
Students write their group’s data on the overhead for class sharing.

(20 Min.) De-brief.
As you look at class data discuss the following:
Compare the difference between the two backgrounds.
Which dots survived the best in the blue/brown background?
Why?
Talk about discrepancies in data and their cause.

(5 Min.) Data analysis and mathematical representation discussion.
Either for homework or during class time – Students will construct graphs and write analysis.

(Homework)
Go back to and re-read your original journal entry about the mouse slide, cross out and rewrite statements where your thinking has changed and explain how your ideas have changed.

Evolution Lesson Study: Part III

Bird beak activity

The population lab could be followed up with a bird beak activity, of which there are several. The classic bird beak activity usually involves having students attempt to pick up various objects with a wide variety of “beaks,” including scissors, spoons, etc. This traditional approach demonstrates competition in an ecological sense, but some are modified to demonstrate variation within a population, which is central to evolution. Links to just a few are:

<http://www.ucmp.berkeley.edu/education/lessons/clipbirds/>
www.pbs.org/wgbh/evolution/educators/course/session6/chen_bbeak_lesson.pdf

---Weeks Later---

Summation Assessment – use preassessment slide (mouse populations)

Name _____
 Period _____

Purpose: To understand the process of natural selection through a simulation of predator/prey relationships

Materials: Fabric, color disks, forceps, graph paper, colored pencils

Procedure:

1. Choose a 'game warden'. Other members of the group will be **predators**.
2. Record the **starting population** in terms of color and the number of each color. (It should be 20 disks for each of the 6 colors)
3. Type of fabric for group is _____.
4. The game warden should spread the starting population around the fabric or "**habitat**".
5. When the game warden says START predators must pick up "**prey**" (disks) for 30 seconds. When the game warden says STOP, predators stop picking up prey.
6. After 30 seconds the remaining disks should be collected and the data recorded in the data table provided. (This data will be graphed)
7. To simulate reproduction for each surviving disk one disk of the same color should be added to the population. These disks represent **offspring**.
8. Repeat the predation using the **second generation**.
9. After the 30 second predation, calculate what the **third generation** starting population should be.

Data Table

Color	White	Red	Blue	Brown	Green	Yellow	Total
Starting Population	20	20	20	20	20	20	120
Killed Prey							
Survivors							
Offspring							
Second Generation							
Killed Prey							
Survivors							
Offspring							
Third Generation							

Data: To graph your data you will need to put the colors in the X-axis and the number on the Y-axis. You will need to graph a starting population graph, a second generation graph and third generation graph.

Results: Compare data for the *Third Generation* on two different habitats:

FABRIC A	White	Red	Blue	Brown	Green	Yellow	Total
Group 1							
Group 2							
Group 3							
Group 4							
FABRIC B							
Group 1							
Group 2							
Group 3							
Group 4							

Analysis: Remember to reflect on what you learned in this lab. Address your understanding of natural selection, predator/prey relationships, habitat, coloration. Please address the following questions:

1. Which color of disks survived the second generation, the third generation?
2. What might be a reason that predators did not select these colors?
3. What effect did capturing a particular color have on the numbers of that color in following generations?
4. How did the different habitats effect the outcome? Why were the results different?
5. What biomes are indicated by the different colored fabrics?
6. How did the predators' method for capturing prey (forceps vs fingers) effect the survival rate of the prey?

Conclusion: Determine what colors were naturally selected by predation in your group.

Final Question: How would you extend this lab? Did this provoke any new questions about predators and prey in your mind?