Science Learning Packet

Grade 8:

Natural Selection, Lesson 8

Science learning activities for SPS students during the COVID-19 school closure.

Seattle Public Schools is committed to making its online information accessible and usable to all people, regardless of ability or technology. Meeting web accessibility guidelines and standards is an ongoing process that we are consistently working to improve.

While Seattle Public Schools endeavors to only post documents optimized for accessibility, due to the nature and complexity of some documents, an accessible version of the document may not be available. In these limited circumstances, the District will provide equally effective alternate access.

Due to the COVID-19 closure, teachers were asked to provide packets of home activities. This is not intended to take the place of regular classroom instruction but will help supplement student learning and provide opportunities for student learning while they are absent from school. Assignments are not required or graded. Because of the unprecedented nature of this health crisis and the District’s swift closure, some home activities may not be accessible.

If you have difficulty accessing the material or have any questions, please contact your student’s teacher.
Grade 8 Science Learning Activity
Natural Selection Unit Instructional Materials
Lesson 8 (Amplify Chapter 3, 3.3)

Amplify Science

Name ___________________________________
School___________________________________
Class Period ______________________________
Teacher ________________________________
Hello Families,

We hope you and your family are well and safe during this time. During this unprecedented out-of-school time, the SPS middle school science team will be offering instructional opportunities for students that align with the district’s adopted middle school science instructional materials.

This investigation packet is part of a series of district-aligned lessons for middle school science developed by AmplifyScience and adopted by SPS in 2019. While Amplify Science lessons are designed to be done in the classroom with peers, there are some activities that students can complete at home. In this packet you will find activities to accompany lessons in the unit.

**Accompanying lesson videos are posted on the SPS Science webpage under their corresponding grade level.** These lesson videos, developed in collaboration between SPS teachers, Denver Public Schools teachers, and Amplify Science, feature teachers going through the information in the lessons. The work in this packet is intended to be completed alongside the viewing of the video of the corresponding videos. To find the correct lesson videos go to SPS Science webpage, scroll to your grade level, find the unit you are looking for, and select the video that matches the lesson you are completing that day.

For students who have access to the internet and the following devices and browsers may wish to log-in to their AmplifyScience account from home are welcome to do so. Chrome and Safari are the recommended browsers to use for full functionality of the Amplify digital tools and features.

Sincerely,

The Seattle Public Schools Science Department
Natural Selection Part 8 suggested materials to accompany the video:

- This packet
- A piece of paper and something to write with
- A person to share ideas with
- Optional: Computer logged into Amplify
3.2 Mutations in a Population (Part 2)

Observing Mutations in the Natural Selection Simulation

You will investigate a low-fur population of ostrilopes with the trait distribution shown in the histogram below.

- In the Sim or through observing your teacher’s results, you will observe ostrilopes that can mutate new traits.
- The environment for this population is changing to cold.
- The starting population only has ostrilopes with fur trait 2 (low fur)

Part 1: Making a Prediction

Think about which new traits would be adaptive and non-adaptive in a cold environment. Label any traits that would be adaptive with an A. Label any traits that would be non-adaptive with an NA.

Are all traits that are introduced by mutations adaptive? Do you think non-adaptive traits can be introduced into a population through mutations? Why or why not?
Part 2: Testing Predictions in the Natural Selection Simulation

**Goal:** Perform tests in the Sim to see if mutations can introduce both adaptive and non-adaptive traits into the population.

**Do:**

- Open the Natural Selection Simulation and open the mode: Mutations and Traits.
- Change the temperature of the environment to cold (Level 1) by moving the Temperature slider.
- Turn ostrilope fur-trait mutations on by pressing the Ostrilope icon and pressing the Mutations toggle.
- Press RUN and observe the population for at least 50 generations.
- Press ANALYZE and use the Generations slider to carefully observe new traits in the population.
- Answer the questions below.

**Tips:**

- Press the Histogram icon in the lower-left corner of Run to observe the introduction of traits into the population.
- Look for the red indicator above the heads of ostrilopes that are born with mutant traits.
This is an example of the results for ostrilope fur-trait from Generation 50 or above.

- Label all traits in the population 50 generations later that are Adaptive with A.
- Label all traits in the population 50 generations later that are Non-Adaptive with NA.
- Label all mutated traits (the ones that weren’t in the starting population histogram) with M.

How do you know the traits you identified in the histogram were adaptive?

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Gr 8 Natural Selection, Lesson 8 (3.3), SPS Science, 4-2020
This is an example of the ostrilope fur-trait histogram from Generation 5

- Label all traits in the population 50 generations later that are Adaptive with A.
- Label all traits in the population 50 generations later that are Non-Adaptive with NA.
- Label all mutated traits (the ones that weren’t in the starting population histogram) with M.

How do you know the traits you identified in the histogram were non-adaptive?

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
Revise your earlier answer to these questions: Are all traits that are introduced by mutations adaptive? Do you think non-adaptive traits can be introduced into a population through mutations? Why or why not?

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

Reflecting on Mutations

Read each of the statements below.
If the statement is true, write “T” on the line before the statement. If the statement is false, write “F” on the line before the statement.

_________ Mutations sometimes result in an adaptive trait.

_________ Mutations sometimes result in a non-adaptive trait.

_________ Traits introduced by mutation will always become more common in a population.

_________ Traits introduced by mutation will sometimes become more common in a population.

- Mutations are changes to genes that can lead to changes to protein molecules, which can result in changes to traits.

- Mutations to genes can sometimes introduce new traits into a population.

Gr 8 Natural Selection, Lesson 8 (3.3), SPS Science, 4-2020
1. Complete the explanation to Sherman. **Well, no Sherman, mutation does not work like that, here’s how it really works . . .**

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

2. If there had been a mutation that led to no fur, what would have happened? (check one)
   - The trait would have been adaptive.
   - The trait would have been non-adaptive.
   - The trait would have become more common over time.
   - The trait would have become less common over time.
3.3 Wrapping Up the Mystery

Warm Up

3. Look back at Sherman’s story on the previous page. Why did the mutation that resulted in a long-hair trait in these rabbits become more common in the population?

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

Key Concept

A new trait will only become more common in a population if it is adaptive.
Write and Share - Discussing How Mutations Change Trait Distribution

Antarctic eelpouts are a type of fish that can be up to three-feet long and that look like eels. They can range in color from yellow to brown. They are found in very cold water, such as in the water near Antarctica.

There are three histograms on your sheet. At Time 1, Antarctic eelpouts used to live in warmer water. When land masses moved millions of years ago, the water became much colder. Time 2 represents some time after the environment changed. Time 3 represents many generations after the environment changed.

You will consider a two different data sets that shows possible changes in a population, given these conditions to answer:

**Did mutations affect which trait was the most common at Time 3? Why or why not?**

Follow the instructions below to participate in the Write and Share routine.

1. Carefully read and annotate the information you are given.
2. Answer your prompt, using the vocabulary words listed.
3. After you had a chance to write, share your responses with a family member or friend.
Write and Share #1

At Time 1, the Antarctic eelpout lived in warmer water. When land masses moved millions of years ago, the water became colder. Time 2 represents some time after the environment changed. Time 3 represents many generations after the environment changed. Review the histograms above and answer the question:

Did mutations affect which trait was the most common at Time 3? Why or why not?

Add annotations to the histograms to help you answer this question. Then, write an explanation about your annotations below. Use all of these words in your explanation:

- adaptive trait
- environment
- mutation
- non-adaptive trait

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
Write and Share #2

At Time 1, the Antarctic eelpout lived in warmer water. When land masses moved millions of years ago, the water became colder. Time 2 represents some time after the environment changed. Time 3 represents many generations after the environment changed. Review the histograms above and answer the question:

Did mutations affect which trait was the most common at Time 3? Why or why not?

Add annotations to the histograms to help you answer this question. Then, write an explanation about your annotations below. Use all of these words in your explanation:

- adaptive trait
- environment
- mutation
- non-adaptive trait
Preparing Your Final Report for Alex Young

**Goal:** Show what caused there to be some extremely poisonous newts in today’s newt population when there were none in the newt population 200 generations ago.

**Do:**
- Analyze all four histograms on the next page and environment descriptions.
- Label Histogram 3 with any Trait labels that apply.

**Tips:**
- You can add multiple Trait labels to a single trait.
- You can use Trait labels more than once, and you do not have to use all of them.

Complete your Newt Mystery Explanation histogram model on the next page first! Then explain how your model answers the question:

*How did a poison-level trait that wasn’t always present in the newt population become the most common trait?*

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
NewtMystery Explanation

**Goal:** Show what caused the red-eyed to evolve extremely poisonous newts in the today’s newt population when there were none in the newt population 200 generations ago.

1. Population 200 Generations Ago
   - Environment: no snakes
   - Trait Labels:
     - $S^+$ = more likely to survive
     - $S^-$ = less likely to survive
     - $O^+$ = likely to have more offspring
     - $O^-$ = likely to have fewer offspring

2. Population 50 Generations Ago
   - Environment: no snakes
   - Trait Labels:
     - $S^+$ = more likely to survive
     - $S^-$ = less likely to survive
     - $O^+$ = likely to have more offspring
     - $O^-$ = likely to have fewer offspring

3. Population 40 Generations Ago
   - Environment: changing from no snakes to snakes
   - Trait Labels:
     - $S^+$ = more likely to survive
     - $S^-$ = less likely to survive
     - $O^+$ = likely to have more offspring
     - $O^-$ = likely to have fewer offspring

4. Population Today
   - Environment: snakes
   - Trait Labels:
     - $S^+$ = more likely to survive
     - $S^-$ = less likely to survive
     - $O^+$ = likely to have more offspring
     - $O^-$ = likely to have fewer offspring

**Trait Labels**
- $S^+$ = more likely to survive
- $S^-$ = less likely to survive
- $O^+$ = likely to have more offspring
- $O^-$ = likely to have fewer offspring
Check Your Understanding

This is a chance for you to reflect on your learning so far. This is not a test. Be open and truthful when you respond to the questions below.

Scientists investigate in order to figure things out. You have been investigating why the newt population in Oregon State Park became more poisonous over time in order to share your ideas with biologist Dr. Alex Young. Are you getting closer to figuring out why the trait for high-poison level became more common in the newt population over time?

1. I understand how a histogram can be used to represent and describe the traits in the newt population. (check one)
   - [ ] yes  [ ] not yet

   Explain your choice above.
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

2. I understand why high-poison levels are adaptive in one environment but not adaptive in another. (check one)
   - [ ] yes  [ ] not yet

   Explain your choice above.
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

3. I understand how the number of newts with high-poison levels increased over time. (check one)
   - [ ] yes  [ ] not yet

   Explain your choice above.
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

Natural Selection—Lesson 3.3—Activity 5
4. I understand why a new trait may or may not become more common in a population. (check one)

☐ yes    ☐ not yet

Explain your choice above.

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

5. What do you still wonder about how the trait for high-poison level became more common in the newt population over time?

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

That’s a wrap for Natural Selection! On behalf of all your teachers, thank you for joining us!