



Only the Strong Survive

Natural Selection



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Published by K20 Center

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Grade Level	9th – 10th Grade	Time Frame	130-150 minutes
Subject	Science	Duration	2-3 class periods
Course	Biology		

Essential Question

How does natural selection contribute to the expansion of some species and the decline of others?

Summary

In this lesson, students will learn about the four points of natural selection and how they drive the evolutionary patterns of a species. Students will determine how to answer evolutionary questions through interpreting graphs and making connections among natural selection concepts. Students also will discover how advantageous traits can increase the survival rate of a species, while unfavorable traits can lead to extinction. This is a multimodality lesson, which means it includes face-to-face, online, and hybrid versions of the lesson. The attachments also include a downloadable Common Cartridge file, which can be imported into a Learning Management System (LMS) such as Canvas or eKadence. The cartridge includes interactive student activities and teacher's notes.

Snapshot

Engage

Students watch a video of a competition between two moose and make predictions about what its outcome means for the moose involved. Students also predict whether one species can influence the evolution of another species.

Explore

Students complete a natural selection lab, collect data, and interpret results. Students add the main ideas to a brainstorming document as they prepare to create a Mind Map.

Explain

Students read an article and watch a video to learn more about the four points of Darwin's natural selection. Students add the main ideas to their brainstorming document and then use the document to develop a Mind Map.

Extend

In groups, students create a comic strip about the four points of natural selection and share it with their peers.*

Evaluate

Students reflect on the lesson and write a summary on the effects of natural selection.

**The online version does not include the comic strip assignment. Instead, the instructions for developing a virtual Mind Map can be found in the Extend section rather than the Explain section.*

Standards

ACT College and Career Readiness Standards - Science (6-12)

- IOD304:** Determine how the values of variables change as the value of another variable changes in a simple data presentation
- IOD403:** Translate information into a table, graph, or diagram
- IOD404:** Perform a simple interpolation or simple extrapolation using data in a table or graph
- IOD502:** Compare or combine data from a complex data presentation
- SIN301:** Understand the methods used in a simple experiment
- SIN401:** Understand a simple experimental design
- SIN502:** Predict the results of an additional trial or measurement in an experiment
- EMI401:** Determine which simple hypothesis, prediction, or conclusion is, or is not, consistent with a data presentation, model, or piece of information in text
- EMI502:** Determine whether presented information, or new information, supports or contradicts a simple hypothesis or conclusion, and why
- EMI504:** Determine which models are supported or weakened by new information
- EMI603:** Use new information to make a prediction based on a model

Oklahoma Academic Standards (Biology)

- B.LS4.5 :** Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
- B.LS4.5.1:** Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species.
- B.LS4.5.2:** Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' adaptation over time is lost.

Attachments

- [\(Online\) Natural Selection Choice Board—Only the Strong Survive - Spanish.pptx](#)
- [\(Online\) Natural Selection Choice Board—Only the Strong Survive.pptx](#)
- [\(Online\) Peppered Moth Lab Grid—Only the Strong Survive - Spanish.pptx](#)
- [\(Online\) Peppered Moth Lab Grid—Only the Strong Survive.pptx](#)
- [\(Online\) Peppered Moth Lab Instructions and Data Sheet—Only the Strong Survive - Spanish.docx](#)
- [\(Online\) Peppered Moth Lab Instructions and Data Sheet—Only the Strong Survive - Spanish.pdf](#)
- [\(Online\) Peppered Moth Lab Instructions and Data Sheet—Only the Strong Survive.docx](#)
- [\(Online\) Peppered Moth Lab Instructions and Data Sheet—Only the Strong Survive.pdf](#)
- [Cognitive Comic Instructions—Only the Strong Survive - Spanish.docx](#)
- [Cognitive Comic Instructions—Only the Strong Survive - Spanish.pdf](#)
- [Cognitive Comic Instructions—Only the Strong Survive.docx](#)
- [Cognitive Comic Instructions—Only the Strong Survive.pdf](#)
- [Cognitive Comic Template—Only the Strong Survive - Spanish.docx](#)
- [Cognitive Comic Template—Only the Strong Survive - Spanish.pdf](#)
- [Cognitive Comic Template—Only the Strong Survive.docx](#)
- [Cognitive Comic Template—Only the Strong Survive.pdf](#)
- [Comic Strip Examples—Only the Strong Survive.pdf](#)
- [Common Cartridge—Only the Strong Survive.zip](#)
- [How I Know It—Only the Strong Survive - Spanish.docx](#)
- [How I Know It—Only the Strong Survive - Spanish.pdf](#)
- [How I Know It—Only the Strong Survive.docx](#)
- [How I Know It—Only the Strong Survive.pdf](#)
- [Lesson Slides—Only the Strong Survive.pptx](#)

- [Mind Map Instructions and Brainstorming Document—Only the Strong Survive - Spanish.docx](#)
- [Mind Map Instructions and Brainstorming Document—Only the Strong Survive - Spanish.pdf](#)
- [Mind Map Instructions and Brainstorming Document—Only the Strong Survive.docx](#)
- [Mind Map Instructions and Brainstorming Document—Only the Strong Survive.pdf](#)
- [R.E.R.U.N. Rubric—Only the Strong Survive - Spanish.docx](#)
- [R.E.R.U.N. Rubric—Only the Strong Survive - Spanish.pdf](#)
- [R.E.R.U.N. Rubric—Only the Strong Survive.docx](#)
- [R.E.R.U.N. Rubric—Only the Strong Survive.pdf](#)

Materials

- Common Cartridge (attached)
- Mind Map Instructions and Brainstorming Document (attached)
- Online Peppered Moth Lab Instructions and Data Sheet (attached)
- Online Peppered Moth Lab Grid (attached)
- Online Natural Selection Choice Board (attached)
- How I Know It handout (attached; optional)

20 minutes

Engage

Introduce the lesson by having students review the essential question: *How does natural selection contribute to the expansion of some species and the decline of others?*

Next, have students watch the following video: "[Watch Moose Fight in a Quiet Alaska Suburb](#)." After the video, ask students to predict the fate of the winner and loser in your course's discussion board by creating a post that answers the following two questions:

- What do you think caused the two moose to battle?
- What do you think will be the outcome for the moose that lost the fight?

Students then should answer the third question below to predict whether one species has the ability to influence the evolution of another species. Students also should respond to two peers' prediction posts based on the third question:

- Do you believe an organism from one species can cause a different species' genes to mutate into a different physical feature?

After students have completed their discussion posts, have students watch the video titled "[The Evolution of Dogs](#)" on how dogs' facial expressions have evolved over time. Finally, ask students to return to the discussion board to share whether their opinion has changed and why or why not.

Teacher's Note: Using the Discussion Board in Your Preferred Online Format

If students are completing this section on their own, monitor students' posts in your LMS's discussion board. To prevent students from viewing the "Evolution of Dogs" video before they have made a prediction post, set a date for that video or hide it by unpublishing it until students have had time to answer the third question. After students have watched the dog video, remind them to revisit their prediction post and reply with any new revelations they may have.

If students are completing this section as a class using a video conferencing platform, show the first video ("Moose Fight") and then direct students to the discussion board to answer the first two questions in a post. After sufficient wait time, share some of the responses and ask students to elaborate, if necessary. Point out any similar opinions students have shared. Next, have students make a prediction in response to the third question and then reply to two peers' predictions. After sufficient wait time, share some responses and show the "Evolution of Dogs" video to students. Finally, have students revisit their prediction post and reply with any new revelations they may have.

30 minutes

Explore

Procedure (Part 1)

Explain to students that, later in the lesson, they must create a [Mind Map](#) about natural selection. The map is meant to serve as a visual representation of the interconnections that exist among several concepts of natural selection. In this section and the Explain section, students must complete several activities to prepare for the creation of their maps.

Teacher's Note: Mind Map Preparation

Before presenting this assignment to students, open the attached **Mind Map Instructions and Brainstorming Document** and decide whether you would like students to use the table or the Venn diagram for their brainstorming document. Edit the instructions to reflect your preference and, in the rubric at the end, set how many points you expect students to have for each activity.

Have students review the attached **Mind Map Instructions and Brainstorming Document**. Let students know their task is to complete a lab, read an article, and watch a video about natural selection to brainstorm ideas for their Mind Map.

Procedure (Part 2)

Have students participate in a [Peppered Moth Game](#) that simulates natural selection's effects on the peppered moth population before and after the Industrial Revolution.

Teacher's Note: Lab Preparation

Before presenting this assignment to students, open the attached **Online Peppered Moth Lab Instructions and Data Sheet** and edit Step 7 in the Procedure section to reflect which LMS you are using. Also consider whether you want students to submit a screenshot of their graph for Question #8 in the Analysis section. If so, you may want to make a note of this at the end of the data sheet.

Additionally, if you want proof of work from students for the initial simulation, add in the following note for Step 5 in the Procedure section: *After completion of the game, in the space below "Print Summary," add your first and last name. Click print, but then select to save it as a PDF. You must submit this PDF along with your work.*

Have students follow along with the attached **Online Peppered Moth Lab Instructions and Data Sheet** so they can fill in their data and responses as they work through the lab. Students also need to use the attached **Online Peppered Moth Lab Grid** to create a graph in response to Question #8.

During or after completion of the lab, have students add the main ideas they have learned about natural selection to their Mind Map Brainstorming Document.

20 minutes

Explain

In this section of the lesson, have students use the [Choice Board](#) strategy and the attached **Online Natural Selection Choice Board**.

Ask students to select an article to read and a video to watch about the four Darwinian points of natural selection and how they relate to genetics and the effects of genetic drift. Students must choose one of each from the following categories:

Articles:

- [Khan Academy's "Darwin, Evolution, & Natural Selection"](#) article, OR
- [CK-12 Foundation's "Natural Selection"](#) article

Videos:

- [Amoeba Sisters' "Genetic Drift"](#) video, OR
- [Amoeba Sisters' "Natural Selection"](#) video

As students complete each activity, have them take notes and then add the main ideas they have learned to their Mind Map Brainstorming Document.

Be sure to provide feedback on each student's brainstorming document before they move on to creating the Mind Map.

40 minutes

Extend

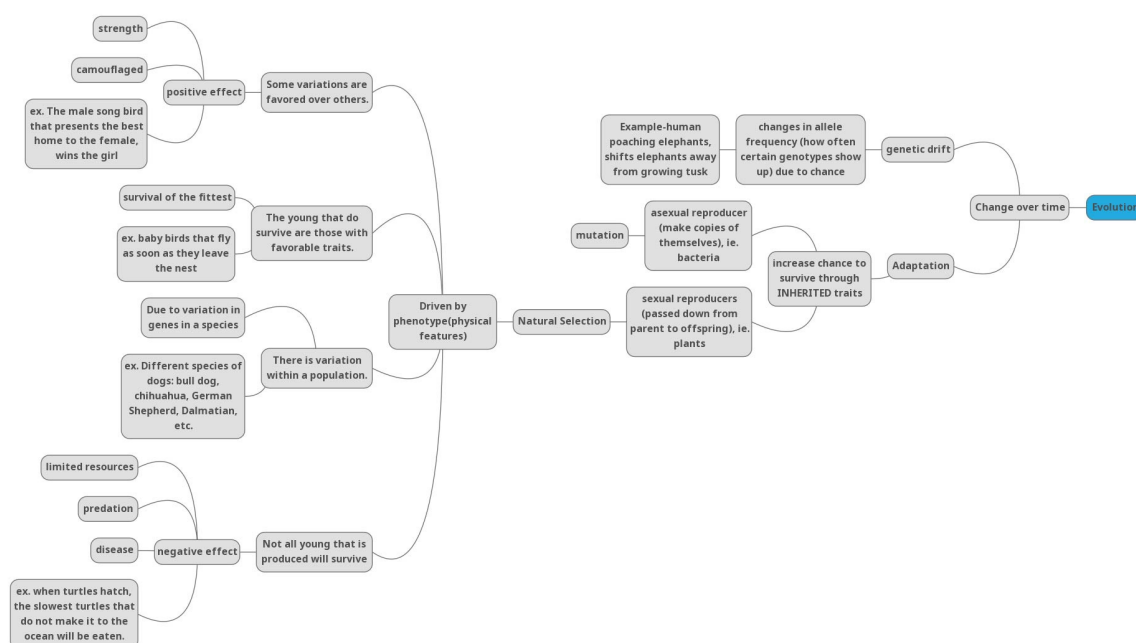
In this section, have each student create a Mind Map using the instructions and brainstorming document they received earlier.

Students may draw their maps by hand and then photograph, upload, and submit them directly in your course's LMS, or they may use a tech tool of their choosing to create the Mind Map.

Optional How-to Video

You may choose to share this video with students for instructions on [how to create a Mind Map using Google Drawings](#).

See below for an example of a Mind Map that was created with [Google Drawings](#).



After students have completed their maps, have them upload their maps to [Padlet](#). Students then should participate in a virtual [Gallery Walk](#) to view one another's maps and give feedback to at least three peers.

20 minutes

Evaluate

Teacher's Note: Vocabulary

You may want to emphasize to students that they should include vocabulary they have learned in their summaries.

Have students use the "[How I Know It](#)" strategy to reflect on the activities they completed and write a summary that explains their understanding of the essential question:

- How does natural selection contribute to the expansion of some species and the decline of others?

Optional Digital Handout

If you wish, you may choose to have each student save their own copy of the attached **How I Know It** handout so they can type in their responses and submit their completed version online.

Be sure to provide students with individual feedback about their summaries.

Resources

- Amoeba Sisters. (2017). Genetic Drift [Video]. YouTube. <https://www.youtube.com/watch?v=W0TM4LQmoZY&list=PLwL0Myd7Dk1FuT0I6icE7octRIglqMBhS&index=7>
- Amoeba Sisters. (2016). Natural Selection [Video]. YouTube. <https://www.youtube.com/watch?v=7VM9YxmULuo>
- Capri23auto. (2019, May 16). Lion [Image]. Pexels. <https://www.pexels.com/photo/lion-2323411/>
- CK-12 Foundation. (2021). 4.3 Natural Selection. <https://flexbooks.ck12.org/cbook/ck-12-middle-school-life-science-2.0/section/4.3/primary/lesson/natural-selection-ms-ls>
- Khan Academy. (2021). Darwin, Evolution, & Natural Selection. <https://www.khanacademy.org/science/ap-biology/natural-selection/natural-selection-ap/a/darwin-evolution-natural-selection>
- K20 Center. (n.d.). Chain Notes. Strategies. <https://learn.k20center.ou.edu/strategy/52>
- K20 Center. (n.d.). Choice Boards. Strategies. <https://learn.k20center.ou.edu/strategy/73>
- K20 Center. (n.d.). Cognitive Comics. Strategies. <https://learn.k20center.ou.edu/strategy/198>
- K20 Center. (n.d.). Gallery Walk / Carousel. Strategies. <https://learn.k20center.ou.edu/strategy/118>
- K20 Center. (n.d.). Google Drawings. Tech tools. <https://learn.k20center.ou.edu/tech-tool/629>
- K20 Center. (n.d.). Google Drawings. External apps tutorials. <https://www.youtube.com/watch?v=2LI8sofXkzs&list=PL-aUhEQeaZXID91azYKwX91vNfNkrANsQ>
- K20 Center. (n.d.). How I Know It. Strategies. <https://learn.k20center.ou.edu/strategy/144>
- K20 Center. (n.d.). Mind Map. Strategies. <https://learn.k20center.ou.edu/strategy/1277>
- K20 Center. (n.d.). Padlet. External apps tutorials. <https://k20center.ou.edu/externalapps/padlet/>
- K20 Center. (n.d.). Padlet. Tech tools. <https://learn.k20center.ou.edu/tech-tool/1077>
- National Geographic. (2015, October 8). Watch Moose Fight in a Quiet Alaska Suburb | National Geographic [Video]. YouTube. <https://www.youtube.com/watch?v=M26ug8MGYIY>
- Nearpod Original. (2020). The Evolution of Dogs [Video]. Nearpod. <https://nearpod.com/t/science/8th/the-evolution-of-dogs-L53964953>
- Teacher Institute of Evolutionary Science. (2019, May 28). This lab is for the birds. Center for Inquiry. <https://tieseducation.org/resource/this-lab-is-for-the-birds/>