



Ch-Ch-Ch-Ch-Changes

Biology



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Grade Level	9th – 10th Grade	Time Frame	212 minutes
Subject	Science	Duration	4-5 periods
Course	Biology		

Essential Question

How does environmental change impact evolutionary shift(s) on an organism's genetic makeup?

Summary

In this lesson, students will examine the facts associated with evolution, infer what fossilized remains can inform us about an organism, explore how evolution is influenced by an ever-changing environment, and construct a timeline of an organism change resulting from environmental factors or human impact over time. 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 answer guiding questions throughout the video about how mutations lead to the evolution of an organism.

Explore

Students determine an organism's lifestyle based on its fossil remains.

Explain

Students analyze how evolutionary selection occurs.

Extend

Students analyze the environmental causes of an organism's evolutionary shift.

Evaluate

Students share their understanding of evolution by creating an evolutionary timeline of an organism.

Standards

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

IOD403: Translate information into a table, graph, or diagram

SIN502: Predict the results of an additional trial or measurement in an experiment

EMI301: Identify implications in a model

EMI401: Determine which simple hypothesis, prediction, or conclusion is, or is not, consistent with a data presentation, model, or piece of information in text

EMI403: Determine which models imply certain information

EMI502: Determine whether presented information, or new information, supports or contradicts a simple hypothesis or conclusion, and why

EMI505: Determine which experimental results or models support or contradict a hypothesis, prediction, or conclusion

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

- [Addie's Story S-I-T Activity—Ch-Ch-Ch-Ch-Changes - Spanish.docx](#)
- [Addie's Story S-I-T Activity—Ch-Ch-Ch-Ch-Changes - Spanish.pdf](#)
- [Addie's Story S-I-T Activity—Ch-Ch-Ch-Ch-Changes.docx](#)
- [Addie's Story S-I-T Activity—Ch-Ch-Ch-Ch-Changes.pdf](#)
- [Addie's Story Video Questions \(Answer Key\)—Ch-Ch-Ch-Ch-Changes.docx](#)
- [Addie's Story Video Questions \(Answer Key\)—Ch-Ch-Ch-Ch-Changes.pdf](#)
- [Addie's Story Video Questions—Ch-Ch-Ch-Ch-Changes - Spanish.docx](#)
- [Addie's Story Video Questions—Ch-Ch-Ch-Ch-Changes - Spanish.pdf](#)
- [Addie's Story Video Questions—Ch-Ch-Ch-Ch-Changes.docx](#)
- [Addie's Story Video Questions—Ch-Ch-Ch-Ch-Changes.pdf](#)
- [Common Cartridge—Ch-Ch-Ch-Ch-Changes.zip](#)
- [Extend Rubric—Ch-Ch-Ch-Ch-Changes - Spanish.docx](#)
- [Extend Rubric—Ch-Ch-Ch-Ch-Changes - Spanish.pdf](#)
- [Extend Rubric—Ch-Ch-Ch-Ch-Changes.docx](#)
- [Extend Rubric—Ch-Ch-Ch-Ch-Changes.pdf](#)
- [Lesson Slides—Ch-Ch-Ch-Ch-Changes.pptx](#)

Materials

- Set-up that allows videos and slide decks to be presented for everyone to view
- Common Cartridge (attached)
- Lesson Slides (attached)
- Addie's Story Video Questions handout (attached; one per student)
- Addie's Story S-I-T Activity handout (attached; one per student)
- Extend Rubric (attached; one per student)
- Sticky notes (one per student)

75 minutes

Engage

Have students watch PBS Frontline's [Hunting the Nightmare Bacteria](#) and answer the questions to the video in your learning management system (LMS) in a quiz format as they follow along. It is recommended that you give the students a couple of days to complete the video.

Optional Modifications

This activity is intended to be done by students on their own, but you are welcome to show the video to the class and have the students answer the question as a class.

Edpuzzle is an alternate platform for this activity. You may replace your LMS's quiz with an Edpuzzle activity using the provided video. See [K20's Edpuzzle Tech Tool card](#) for more information.

Teacher's Note: Completing as a Class

If completing as a class: At the 33-minute mark of the movie, you may pause and explain the following: "the petri dish shows a resistance test. Each white disc is a piece of paper infused with a different antibiotic. The clear area around the center disc shows that antibiotic is effective against the bacteria being tested. The one on the left is partially effective, while the others show the bacteria is resistant to those antibiotics because it has grown right up to the disc."

After students have completed the questions from the previous activity, introduce the [S-I-T \(Surprising, Interesting, Troubling\) strategy](#). Ask students to use this strategy to create a discussion post in your LMS. Instruct students to include the following information in their discussion post:

Identify the following from the video:

- *One surprising fact or idea*
- *One interesting fact or idea*
- *One troubling fact or idea*

Next, have students choose one of the three points made by a peer and give additional input to that fact or idea from the video. This peer response could be added through words or an image. Be sure to remind to students to follow proper netiquette when posting and responding to peers.

Teacher's Note: Recommended Discussion Settings

To help students develop their own opinions and to allow for student discourse, it is recommended that you update the discussion options to allow for threaded replies and to hide previous discussion posts prior to posting.

For information about facilitating an effective online discussion, visit the following link: [the K20 Center's best practices for facilitating online discussions](#).

30 minutes

Explore

This assignment can be completed in [Nearpod](#) or in a discussion board in your LMS. Students should use a modified version of the [Photo Deconstruction strategy](#). Have students view a photo of a fossilized organism (one provided by you or one of their choosing) and infer about this animal's lifestyle based on its fossil (e.g. what it might have eaten, what area it may have lived, what animal it could be related to and why). Students should then view three classmates' responses and add their own replies that elaborate on their peers' opinions. Consider also showing a side-by-side fossil of an organism today compared to the fossil of its ancestor for students to note differences. Have them infer what may have caused that change.

Teacher's Note: Completing as a Class

If completing as a class: Clear up some potential misconceptions or emphasize any comments that are aligned to the standard. Recognize comments that are being stated multiple times—this could be an indicator that you may not need to spend much time later in the lesson on explaining it.

If students are completing this activity on their own, you can use Nearpod to the same effect. Give a date & time for the initial post and peer response post. Be sure to have students add their names or initials next to their post and peer responses. If you like, after the discussion, you can share the true origin of this fossil, the extinct *Raphus cucullatus*, dodo bird, to allow students to compare their observations to those of researchers:

- [Why the Dodo Deserves a New Reputation](#)
 - Huizen, Jennifer. (2015, October 26). Why the Dodo Deserves a New Reputation. Audubon. <https://www.audubon.org/news/why-dodo-deserves-new-reputation>

15 minutes

Explain

Have students watch an Edpuzzle on [Evolution 101](#) and answer the questions throughout. **You will need to assign the Edpuzzle to the students so that they are not accessing the editable version with answers.** At the end of the video, students should be directed to [Mentimeter](#) to create a word cloud. Students should contribute one or two words that express an overall concept or theme based on what they gathered about evolution from this video.

Teacher's Note: Completing as a Class

If completing as a class, share the cloud to the group, commenting on what is being said the most and keying in and elaborating on major points made.

If independent work, allow 24 hours for completion of the video questions and word cloud. After students have submitted their projects, post the word cloud results in your LMS, either via embedding or screenshot. View an example word cloud in Mentimeter here: [Mentimeter link](#).

90 minutes

Extend

Invite students to develop a timeline of an organism (plant, animal, fungi, bacteria, protist) of their choice. A program such as [Adobe Spark](#) can be used for this activity. Students will need to show:

- How the organism has evolved over time in at least three different periods.
- What the environmental conditions and factors were that may have caused an evolutionary shift during each time period.

Optional: Variety

If you want more variety among kingdoms, you can assign each student a kingdom from which they can choose their organism.

Teacher's Note: Rubric

See the attached **Extend Rubric** to evaluate students' submissions.

If meeting with students, go over the instructions and rubric to make sure students know what is expected of them.

Have students share their findings with the class.

2 minutes

Evaluate

Teacher's Note

Create a discussion board in [Padlet](#) and share the link and QR code on **slide 13** with your students.

Go to **slide 13**. Instruct students to complete the [I Used to Think... But Now I Know](#) activity. Have students respond to the prompt in [Padlet](#), comparing what they used to think about evolution with what they now know. In addition, ask students to respond to at least two of their classmates' posts.

Teacher's Note: Activity Details and Goals

The [I Used to Think... But Now I Know](#) and [Padlet](#) activities enable students to examine any misconceptions they may have about evolution and, more importantly, help them understand the role environment plays as an organism adapts in order to survive.

Resources

- Hudson Institute of Mineralogy. (1993). [Vadasaurus herzogi](https://www.mindat.org/taxon-9398973.html).
<https://www.mindat.org/taxon-9398973.html>
- John Hopkins University Staff. (2017, December 07). Meet Vadasaurus, a foot-long, ancient swimming reptile.
<https://hub.jhu.edu/2017/12/07/vadasaurus-reptile-fossil/>
- K20 Center. (n.d.). S-I-T. Strategies. <https://learn.k20center.ou.edu/strategy/926>
- K20 Center. (n.d.). Chain notes. Strategies. <https://learn.k20center.ou.edu/strategy/52>
- K20 Center. (n.d.). Edpuzzle. Tech tools. <https://learn.k20center.ou.edu/tech-tool/622>
- K20 Center. (n.d.). Padlet. Tech tools. <https://learn.k20center.ou.edu/tech-tool/1077>
- Micu, A. (2017, November 08). Fossilized ancient lizard shows how dinos evolved to live in the oceans.
<https://www.zmescience.com/science/ancient-lizard-dino-evolve-ocean-0432/%C2%A0>
- PBS Online: Nova Labs. (2020). Evolution 101. | WGBH Educational Foundation.
<https://www.pbs.org/wgbh/nova/labs/lab/evolution/research#/chooser>
- Young, R. (2013, October 23). Hunting the Nightmare Bacteria. | PBS.
<https://www.pbs.org/wgbh/frontline/film/hunting-the-nightmare-bacteria/>