She Sells Seashells by the Seashore

Biology

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Grade Level	9th – 10th Grade	**Time Frame**	185 Minutes
Subject	Science	**Duration**	4-5 Periods
Course	Biology		

Essential Question

Which principles help provide evidence of evolution among organisms?

Summary

In this lesson, students will learn about paleontologists who have helped shape our understanding of organisms' evolutionary history. They will research and evaluate evidence that scientists have used to construct and continually use to reconstruct evolutionary history and environmental pressures that cause evolutionary shifts. This lesson is part two of a three-part series. Lesson 1, Ch-Ch-Ch-Ch-Changes, is intended to help students define evolution. 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 while watching a video about the life of paleontologist Mary Anning and then create an advertisement that celebrates her work.

Explore

Students view scientific evidence of a prehistoric whale.

Explain

Students research and present an evolutionary principle or type of selection and take notes as other students present.

Extend

Students play a game to assess their knowledge of the principles of evolution and types of selection.

Evaluate

Students identify and reflect on their own learning related to evolutionary principles.

Standards

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

IOD202: Identify basic features of a table, graph, or diagram (e.g., units of measurement)
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
IOD505: Analyze presented information when given new, simple information
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
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

- Ancient Whale Bones Questions Answer Key—She Sells Seashells.docx
- Ancient Whale Bones Questions Answer Key—She Sells Seashells.pdf
- Ancient Whale Bones Questions—She Sells Seashells - Spanish.docx
- Ancient Whale Bones Questions—She Sells Seashells - Spanish.pdf
- Ancient Whale Bones Questions—She Sells Seashells.docx
- Ancient Whale Bones Questions—She Sells Seashells.pdf
- Common Cartridge—She Sells Seashells.zip
- Evolution Card Sort Answer Key—She Sells Seashells.docx
- Evolution Card Sort Answer Key—She Sells Seashells.pdf
- Evolution Card Sort—She Sells Seashells - Spanish.docx
- Evolution Card Sort—She Sells Seashells - Spanish.pdf
- Evolution Card Sort—She Sells Seashells.docx
- Evolution Card Sort—She Sells Seashells.pdf
- Evolution Cornell Notes—She Sells Seashells - Spanish.docx
- Evolution Cornell Notes—She Sells Seashells - Spanish.pdf
- Evolution Cornell Notes—She Sells Seashells.docx
- Evolution Cornell Notes—She Sells Seashells.pdf
- Evolution Presentation Rubric—She Sells Seashells - Spanish.docx
- Evolution Presentation Rubric—She Sells Seashells - Spanish.pdf
- Evolution Presentation Rubric—She Sells Seashells.docx
- Evolution Presentation Rubric—She Sells Seashells.pdf
- Evolution Research Draft—She Sells Seashells - Spanish.docx
- Evolution Research Draft—She Sells Seashells - Spanish.pdf
- Evolution Research Draft—She Sells Seashells.docx
- Evolution Research Draft—She Sells Seashells.pdf

- Evolution Slide Creation Instructions—She Sells Seashells - Spanish.docx
- Evolution Slide Creation Instructions—She Sells Seashells - Spanish.pdf
- Evolution Slide Creation Instructions—She Sells Seashells.docx
- Evolution Slide Creation Instructions—She Sells Seashells.pdf
- Lesson Slides—She Sells Seashells.pptx

Materials

- Common Cartridge (attached)
- Lesson Slides (attached)
- Evolution Presentation Instructions (attached, one per group of three students)
- Evolution Research Draft handout (attached, one per group of three students)
- Evolution Presentation Rubric (attached, one per student)
- Evolution Cornell Notes handout (attached, one per student)

20 minutes

Engage (Face-to-Face)

Teacher's Note: Lesson Series

This lesson is part two of a three-part series. You can find the first lesson in the series, Ch-Ch-Ch-Changes, here.

Use the attached **Lesson Slides** to follow along with the lesson. Begin with **slide 3.** Read aloud the essential question, and then move to **slide 4** and share the objectives.

Go to **slide 5**. Inform students that they will be watching a video about paleontologist Mary Anning from BBC Ideas. As they watch the video, students should note any words that come to mind that help describe Anning's life and work.

Embedded video
https://youtube.com/watch?v=BEbgTpdwRgI

Teacher's Note: Alternative Video

The tension between Christianity and the scientific discovery of extinction is mentioned briefly at the 1:25 mark. If you prefer not to bring religion into the discussion, you could consider using the video Mary Anning's Story from the Lyme Regis Museum as a possible alternative.

After the end of the video, go to **slide 6**. Provide students with the following prompt:

> Imagine that you work at a museum and want to let people know about your new Mary Anning exhibit. Compose a Six-Word Memoir about Anning and her contribution to evolution that will help attract visitors to this exhibit.

After students are done writing, inform them that they will be voting on which memoir they believe is the most intriguing and would best attract people to the exhibit. Divide students into groups of four to read their memoirs and vote on the one they like the best. Have those with the most votes read their memoirs to the whole class and have the class vote on the best memoir for the Mary Anning exhibit.

Teacher's Note: Monitoring Student Progress

Circulate around the room to observe as students create their Six-Word Memoirs and share them within their groups.

15 minutes

Explore (Online)

Students will watch National Geographic's Ancient Whale Bones video and answer the associated questions in your LMS's Quizzes section as they follow along. Compile students' responses to question 6 into a Driving Question Board using a Google Doc, or have students add their responses to a Padlet board. Save the responses and inform students that you will revisit them later.

Optional Modifications

- This activity is intended to be done by students on their own, but you could also watch the video and have the students answer the questions as a class.
- Consider replacing the quiz with an activity based on the video: Edpuzzle's Ancient Whale Bones | National Geographic.
  To learn more about Edpuzzle, visit the K20 Center's Edpuzzle Tutorials page.
- If you use Padlet for this activity, be sure to monitor the board and remove editing permissions from students after you have gathered their questions.
  To learn more about how to create a Padlet board and share it in your LMS, visit the K20 Center's Padlet Tutorials page.

Possible Questions

Questions that students identify might include:

- How did the changes occur in the whale?
- How long does it take for a drastic change like this to occur?
- Can the whale evolve to be back on land?
- Are whales closely related to land animals, fish, or both?
- Are there land animals related to the whale?

Next, students will complete a Card Sort activity in the Quizzes section of your LMS to associate evolution-related terms and definitions with images. Be sure to let students know that even though it appears in the Quizzes section, this activity will be graded as an assignment and not as a quiz.

Teacher's Note: Group or Individual Considerations

- If students will be completing the Card Sort as a class, consider breaking them into groups of 2-4.
- If students will be completing the Card Sort on their own, give them at least 24 hours to complete the activity.

90 minutes

Explain (Face-to-Face)

Go to **slide 9**. Review the seven principles that have helped scientists reconstruct an organism's evolutionary history and three types of evolutionary selection, which represent the different ways that scientists graphically depict evolutionary change over time.

Inform students that they will be creating a slide related to one of the seven principles or three types of selection. On their slide, they should explain how the principle has reconstructed evolutionary history and provide examples. Students will add their slide to a class slideshow and present it to the class.

Split students into groups of three. Pass out the **Evolution Presentation Instructions**, **Evolution Research Draft,** and **Evolution Presentation Rubric** handouts. Go to **slide 10** and inform students that they will start by compiling and constructing a rough draft of their assigned topic on the Evolution Research Draft handout. Have students review the instructions and the specific requirements detailed on the rubric and spend the class period researching the information for their slide for you to review. After you approve the content, groups should create and submit their slides. Remind students to double-check the rubric again before they finish.

Set a presentation date for students. Make sure to emphasize that each group member must present their own portion of the slide content. On presentation day, pass out copies of the **Evolution Cornell Notes** sheet and have students take notes as their peers are presenting. They should also write a short synopsis of their own topic on their note sheet.

40 minutes

Extend (Online)

Procedure 1: Create a free Blooket account. Students will use Blooket to assess their knowledge of the evolutionary principles and types of evolutionary selection by playing the She Sells Seashells by the Seashore game.

Teacher's Note: About Blooket

If you are familiar with Kahoot, Blooket is similar. However, Blooket offers multiple options for games and can be played synchronously with the class or asynchronously with students playing on their own.

For synchronous play, we recommend the "Racing" game option. You can control how many times questions are asked for students to improve and lengthen the game. For asynchronous play, we recommend "Crazy Kingdom" and "Factory" set for 10 minutes for solo gaming. At the end of the game, you can have students take a screen shot their score to upload into the LMS.

Log in to the Blooket account that you created, select the teacher option, and search for the She Sells Seashells by the Seashore game. Click the Host button to select the game mode. To play the game, students will need to go to blooket.com/play, enter the game ID, and join the game. Copy the game ID and share the code in the assignment description in your LMS.

Students' goal is to get as many questions correct as fast as they can to outscore their peers and win the race.

Procedure 2: After completing the game, students will complete a Spend A Buck activity. Students should access Mentimeter using the code you provide. From there, they will distribute their 100 points across the 10 concepts from the Explain activity based on where they believe the evolution of the whale from the Ancient Whale video falls in accordance with the principles of evolution and the types of selection.

20 minutes

Evaluate (Face-to-Face)

Revisit the Driving Questions Board that you compiled from question 6 of the Ancient Whale video. Share the questions again and ask students to choose one question from the list.

Go to **slide 13**. On a piece of paper, have students indicate which one of the questions they chose and provide a 2-3 sentence answer based on what they have learned about the principles of evolution and the types of selection.

When they are finished writing their answers, have students discuss what they wrote with a small group and come up with a group summary. Have one student from each group share the summary with the class.

Research Rationale

Learners learn best when they can contextualize what they learn for immediate application, and they acquire personal meaning by reflecting on experiences while participating in a social-dialogical process (Piaget, 1950).

Approach to learning with technology: The aim of learning with technology is "knowledge construction, not reproduction, conversation, not reception; articulation, not repetition, collaboration, not competition; and reflection, not prescription" (Jonassen, Howland, Moore, & Marra, 2003).

Resources

- BBC Ideas. (2019, March 27). The true story of Mary Anning: The girl who helped discover dinosaurs. | BBC ideas [Video]. YouTube. https://www.youtube.com/watch?v=BEbgTpdwRgI
- K20 Center. (n.d.). Blooket. Tech Tools. https://learn.k20center.ou.edu/tech-tool/2386
- K20 Center. (n.d.). EdPuzzle. Tech Tools. https://learn.k20center.ou.edu/tech-tool/622
- K20 Center. (n.d.). Kahoot!. Tech Tools. https://learn.k20center.ou.edu/tech-tool/637
- K20 Center. (n.d.). Mentimeter. Tech Tools. https://learn.k20center.ou.edu/tech-tool/645
- K20 Center. (n.d.). Padlet. Tech Tools. https://learn.k20center.ou.edu/tech-tool/1077
- K20 Center. (n.d.). Parking lot. Strategies. https://learn.k20center.ou.edu/strategy/131
- K20 Center. (n.d.). Six-Word memoirs. Strategies. https://learn.k20center.ou.edu/strategy/75
- K20 Center. (n.d.). Spend a buck. Strategies. https://learn.k20center.ou.edu/strategy/154
- Lyme Regis Museum (2020, June 23). Mary Anning's story [Video]. YouTube. https://www.youtube.com/watch?v=5YBiYQXtdM8
- National Geographic. (2009, February 4). Ancient whale bones | National Geographic [Video]. YouTube. https://www.youtube.com/watch?v=WK8i8_qsWjo