

How EGG-ceptional Are We? (Middle School)

Evolution: Embryonic Development

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Grade Level	7th – 8th Grade	**Time Frame**	150 minutes
Subject	Science	**Duration**	2-3 class periods
Course	Biology		

Essential Question

How do we decide what to believe about evolutionary claims?

Summary

Students will investigate the similarity of reproduction, embryonic development, and DNA sequences to illustrate the indirect evidence for evolution. This lesson is adapted for a middle school class.

Snapshot

Engage

Students listen to the storybook *An Egg Is Quiet* then discuss observations from the book.

Explore

Students attempt to sort embryo images into similar groups.

Explain

Students use a second card sort and analysis questions to draw conclusions.

Extend

Students analyze a graph to draw conclusions about similarities between organisms.

Evaluate

Students answer open response questions to collect their thoughts and ideas.

Standards

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

IOD402: Compare or combine data from a simple data presentation (e.g., order or sum data from a table)
IOD403: Translate information into a table, graph, or diagram
EMI401: Determine which simple hypothesis, prediction, or conclusion is, or is not, consistent with a data presentation, model, or piece of information in text
EMI404: Identify similarities and differences between models

Oklahoma Academic Standards (8th Grade)

8.ESS1: Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.
8.LS4.3.1: Comparison of embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy.

Attachments

- Analysis Questions—How EGG-ceptional Are We - Spanish.docx
- Analysis Questions—How EGG-ceptional Are We - Spanish.pdf
- Analysis Questions—How EGG-ceptional Are We.docx
- Analysis Questions—How EGG-ceptional Are We.pdf
- Animal Embryo Development Graph—How EGG-ceptional Are We - Spanish.docx
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- Animal Embryo Development Graph—How EGG-ceptional Are We.docx
- Animal Embryo Development Graph—How EGG-ceptional Are We.pdf
- Embryo Card Sort - Student Version—How EGG-ceptional Are We - Spanish.docx
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- Embryo Card Sort - Teacher Version—How EGG-ceptional Are We.docx
- Embryo Card Sort - Teacher Version—How EGG-ceptional Are We.pdf
- Explain Card Sort—How EGG-ceptional Are We - Spanish.docx
- Explain Card Sort—How EGG-ceptional Are We - Spanish.pdf
- Explain Card Sort—How EGG-ceptional Are We.docx
- Explain Card Sort—How EGG-ceptional Are We.pdf
- I Used to Think But Now I Know—How EGG-ceptional Are We - Spanish.docx
- I Used to Think But Now I Know—How EGG-ceptional Are We - Spanish.pdf
- I Used to Think But Now I Know—How EGG-ceptional Are We.docx
- I Used to Think But Now I Know—How EGG-ceptional Are We.pdf
- Lesson Slides—How EGG-ceptional Are We.pptx

Materials

- Lesson Slides (attached)
- *An Egg Is Quiet* by Dianna Aston
- Student Version Embryo Card Sort (attached; print one-sided; cut out; one per group of 2-3)
- Teacher Version Embryo Card Sort (attached)
- Explain Card Sort (attached; print one-sided; cut out; one per group of 2-3)
- Analysis Questions (attached; print one-side; one half-sheet per student)
- Animal Embryo Development Graph (attached; print one-side; one per student)
- I Used to Think But Now I Know handout (attached; print one-sided; one half-sheet per student)
- Sticky notes (one stack per group of 2-3)

Preparation

Before beginning the lesson, gather and prepare all necessary materials and handouts. If using a physical copy of *An Egg Is Quiet* by Dianna Aston, ensure it is available and ready for use during the Engage phase. If the book is not available, plan to show the read-aloud video An Egg Is Quiet instead.

Print and cut out the following materials:

- Student Version Embryo Card Sort: Print one-sided and cut out one full Card Sort (both Set A and B) per group of 2–3 students.
- Explain Card Sort: Print one-sided and cut out one set per group of 2–3 students.

10 minutes

Engage

Open the attached **Lesson Slides**. Review the essential question and lesson objectives on **slide 3**–**4**.

Move to **slide 5**, have students take out a piece of paper, and introduce students to the I Notice, I Wonder instructional strategy. On their paper, ask them to make two columns labeling the left column "I Notice" and the right column "I Wonder." Explain to students that they will be listening to a book, and as they listen, they should write down observations they notice and questions or topics they have regarding the content.

Read the picture book *An Egg Is Quiet* by Dianna Aston to students.

Alternative Facilitation

If you do not have access to a physical copy of the book, show students the following *An Egg Is Quiet* read-aloud video on YouTube. Students should use the I Notice, I Wonder strategy to write down observations, important details, and questions they have as they listen to the book.

After you have finished the book, provide students a few minutes to complete their I Notice, I Wonder chart.

Display **slide 6**. Pair students up and have them share what they've written. If needed, revisit the book (or copies of the book's pages) to either reinforce the observations they made or to revise them. Also, encourage students to use this time to discuss the questions they wrote and decide if rereading the book would answer the questions or if further investigation is needed.

Teacher's Note: Appropriate Observations

Considering the context of the lesson, it would be ideal for students to get to the point of observing multiple, diverse species, which all reproduce through egg/embryonic development. Also, all eggs—even though they are all different in shape, size, and species—function in the same way: protection and nutrition.

20 minutes

Explore

Display **slide 7**. Introduce the Card Sort instructional strategy and pass out the Embryo Card Sort cards labeled as “Set A” from the attached **Student Version Embryo Cards** to groups of two or three students. Prompt students to group together embryos that they think are similar. There are no duplicates, so each animal is unique, and possible categories could be mammals, reptiles, amphibians, etc. Try to leave the prompt open-ended, such as, “Group together what you think are similar.” Some students might think the cards show the same animals in different developmental stages, but that’s part of the process.

When students are done, move to **slide 8** and pass out a stack of sticky notes to each group of students. Have students participate in a modified Gallery Walk. Students should use as many sticky notes as they have groupings. On each sticky note, have students write why they chose to group specific cards together for each category. These will become category headings. Then, prompt groups to rotate and read the other groups' ideas. When a full rotation has happened, give time for students to decide if they want to change their original groupings or not.

Expand on the idea by passing out the “Set B” Embryo Card Sort cards from the same document to each group, so that both Set A and Set B are together. Provide the prompt again to create groups. Students will probably understand that the idea is to pair the embryo with the developed animal but try not to give it away.

The answers of what embryo is what animal are included in the attached Teacher Guide?and Lesson Slides (**slides 9–17**) to show students. Before showing the answers on the slides, allow students to experience a healthy struggle with the card sort activity.

25 minutes

Explain

Let students keep the Embryo Card Sort cards for reference during the Explain and some of the Extend.

Display **slide 18**. Hand out the attached **Explain Card Sort** cards, which have a few of the stages of a chicken embryo and a mouse embryo. Read the prompt provided on the slide: "There are two sets. Separate them and put each set in order." Allow students to work on this in pairs.

Teacher's Note: Another Card Sort?

Embryonic similarities are based on visual characteristics that are similar then different as the embryo develops. There are multiple card sorts in this lesson so that students receive multiple kinds of pictures and perspectives to be able to draw conclusions from all the evidence. Think of this as adding another layer of understanding and thus another visual example for students to process.

Once students have addressed the card sort prompt, move to **slide 19** and distribute the attached **Analysis Questions** handout. Review the Inverted Pyramid strategy. Have students answer the analysis questions individually on their handout before having them share with partners. Ask pairs to create a shared answer that represents both of their answers.

Next, have pairs join together to make a group of four, sharing again, this time with a focus on the statements generated. Once the groups of four construct a singe, shared statement, ask each group to share with the whole class. Write each group's statement on the board for everyone to see.

From here, move to **slide 20** and explain to students how all organisms develop in the same stages, called Carnegie Stages, but they go through those stages at different rates and sizes. Explain how the organ shapes will be different for different animals, but the stages to develop those organs themselves are all the same.

Optional Content and Slides

In the Lesson Slides, there is a very simplified breakdown of the Carnegie Stages (**slides 21–23**). These slides are optional, so hide the slides if using an alternative method. However you choose to explain the Carnegie Stages, there needs to be an emphasis on the similarities of organisms in the progression, but also how (especially in the later stages) the physical appearance of each organism may look different within the stages.

Optional Resource:

For optional material, consider referencing the following article on chick development: "A Series of Normal Stages in the Development of the Chick Embryo." It's a long read, but a good one for kids who are interested.

20 minutes

Extend

Move to **slide 24** and distribute the attached **Animal Embryo Development Graph** to each student. Have them construct the chart and answer the questions. Allow them to use this data to support their products in the Evaluate section.

Evaluate

Display **slide 25** and pass out the attached **I Used to Think But Now I Know** half-sheet handout. Allow students about 5 minutes to reflect on what was presented to them and compare what they used to think about embryos and fetal development with what they now know on their handouts, using the I Used to Think...But Now I Know instructional strategy. Have students share their responses with a partner before turning their responses in as an Exit Ticket.

Teacher's Note: What Are Acceptable Responses?

Most of the time, students will talk about how they didn't realize how babies develop or make that connection with pregnancy. Students may connect with the information presented, or they may resist it because of other information or what they've been told in other places. Don't force particular statements; otherwise, it may be impossible to tell what a student is or is not retaining. Evaluate doesn't always mean "right" or "wrong"—in this case, it means, "What conclusions did individual students come to?"

Resources

- K20 Center. (n.d.). Bell ringers and exit tickets. Strategies. https://learn.k20center.ou.edu/strategy/125
- K20 Center. (n.d.). Card sort. Strategies. https://learn.k20center.ou.edu/strategy/147
- K20 Center. (n.d.). Gallery walk/carousel. Strategies. https://learn.k20center.ou.edu/strategy/118
- K20 Center. (n.d.). Inverted pyramid. Strategies. https://learn.k20center.ou.edu/strategy/173
- K20 Center. (n.d.). I notice, I wonder. Strategies. https://learn.k20center.ou.edu/strategy/180
- K20 Center. (n.d.). I used to think...but now I know. Strategies. https://learn.k20center.ou.edu/strategy/137
- Sunshine lemonade. (2016). *An egg is quiet* [Video of book read-aloud]. YouTube. https://www.youtube.com/watch?v=KgVaNbrCayU