

LESSON 16: Why are living things different from one another?

PREVIOUS LESSON *We checked on our planaria and shared our observations about their development. We revised our classroom consensus model to reflect how different factors influence musculature in cattle. We read about other examples of trait variations and developed models to communicate how genes and environmental factors impact that trait.*

THIS LESSON

PUTTING PIECES TOGETHER

2 days



The class revisits its Driving Question Board to evaluate and answer their questions. The students use this time to ask any clarifying questions to refine their understanding about their models for how living things are different from one another. Then students demonstrate understanding on a summative assessment transfer task involving goldfish.

NEXT LESSON *There is no next lesson.*

BUILDING TOWARD NGSS

MS-LS1-5, MS-LS3-1, MS-LS3-2,
MS-LS4-5



WHAT STUDENTS WILL DO

Obtain, evaluate, and communicate information to explain what causes living things to be different from one another.

Construct an explanation using models or representations to describe how environmental and genetic factors influence the growth of organisms and why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation in the context of goldfish coloration and size.

WHAT STUDENTS WILL FIGURE OUT

- All living things have genetic information.
- Genetic information is passed from parents to offspring either sexually (which can result in variations) or asexually (the offspring get exactly the same genetic information as the parent).
- Genetic information has instructions to put together building blocks to make different-shaped proteins.
- Each gene gives instructions for a type of protein, and the shape of a protein influences its job.
- Living things have thousands of different proteins.
- Differences in those proteins in combination with environmental factors result in the variations that exist between living things.

Lesson 16 • Learning Plan Snapshot

Part	Duration	Summary	Slide	Materials
1	5 min	NAVIGATION Work with the class to navigate to the work in this lesson.	A	
2	15 min	EVALUATE OUR QUESTIONS ON THE DQB Students individually evaluate our list of questions for questions they think we have made progress on. They pick three questions and write a response using evidence collected during the unit, and share their responses with a partner. Then students place sticky dots on the questions they think we have made progress on and move into their Scientists Circle.	B-D	<i>Questions from Our DQB, 5 sticky dots, Driving Question Board, space for a Scientists Circle</i>
3	25 min	REVISIT THE DRIVING QUESTION BOARD Revisit the DQB with the whole class and take stock of all the questions we've now answered. Ask new questions to help clarify class models in preparation for the summative assessment on day 2 of this lesson.	E	<i>Questions from Our DQB, Driving Question Board, space for a Scientists Circle</i>
4	5 min	UPDATE OUR PROGRESS TRACKERS Allow time for students to update their 2-column Progress Trackers.	F	Progress Tracker
<i>End of day 1</i>				
5	37 min	DEMONSTRATE UNDERSTANDING ON AN ASSESSMENT TASK Students individually demonstrate understanding on an assessment about breeding goldfish.		<i>Summative Assessment, Checklist for Obtaining Information From Scientific Text</i>
6	8 min	QUICK WRITE: REFLECT ON OUR EXPERIENCES (OPTIONAL) Students discuss what was challenging and rewarding about this unit.		
<i>End of day 2</i>				

Lesson 16 • Materials List

	per student	per group	per class
Lesson materials	<ul style="list-style-type: none">• science notebook• <i>Questions from Our DQB</i>• 5 sticky dots• Progress Tracker• <i>Summative Assessment</i>• <i>Checklist for Obtaining Information From Scientific Text</i>		<ul style="list-style-type: none">• Driving Question Board• space for a Scientists Circle

Materials preparation (25 minutes)

Review teacher guide, slides, and teacher references or keys (if applicable).

Make copies of handouts and ensure sufficient copies of student references, readings, and procedures are available.

Create the handout *Questions from Our DQB* for your class:

- Use a digital copy of *Questions from Our DQB* as a template. List all of the questions students developed on the Driving Question Board on the bottom of the handout. For ease of reference you can number each of the questions on the DQB and make sure the handout has the corresponding number next to that question. Then, print sufficient copies for each student.

Lesson 16 • Where We Are Going and NOT Going

Where We Are Going

This is the last lesson in this unit and students will be using the knowledge they gained to demonstrate understanding on a summative assessment. In the assessment students will be using the DCI element: LS1.B: Growth and Development of Organisms “Genetic factors as well as local conditions affect the growth of the adult plant.” in the context of goldfish growth. Students will use DCI elements LS1.B “Organisms reproduce(...), and transfer their genetic information to their offspring.” LS3.A Inheritance of Traits “Each distinct gene chiefly controls the production of specific proteins, which in turn affect the traits of the individual.” and LS4.B Natural Selection “In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring” in the context of goldfish coloration.

Where We Are NOT Going

The summative assessment does not reassess the understanding of the DCI elements demonstrated in the assessment for Lesson 8. The assessment works with a trait that has an incomplete dominance inheritance pattern like myostatin. However, we do not ask that students “name” this inheritance pattern as “incomplete dominance” because since we have not studied dominant/recessive inheritance patterns, the term incomplete dominance might not make sense to students. If teachers add Mendelian inheritance patterns in addition to the material in this unit, one could choose to distinguish between incomplete vs. typical dominance.

LEARNING PLAN for LESSON 16

1 · NAVIGATION

5 min

MATERIALS: None

Navigate to the purpose of today's class. Display **slide A**. Have students turn and talk to a partner about what the class figured out last class. Ask for a few volunteers to share their ideas.

Say, *Wow we figured out so many different pieces to help answer our big question, "Why are living things different from one another?" Let's take some time to revisit our questions on our DQB to see if we've answered any of our own questions.*

2 · EVALUATE OUR QUESTIONS ON THE DQB

15 min

MATERIALS: science notebook, *Questions from Our DQB*, 5 sticky dots, Driving Question Board, space for a Scientists Circle

Have students work individually to evaluate what questions the class has answered from the DQB. Display **slide B**. Provide students with *Questions from Our DQB*, which you created to contain all of the student questions from the DQB, and have students tape it into their science notebooks. Have students work to mark questions they think the class has answered.

- We did not answer this question or any parts of it yet: ○
- Our class answered some parts of this question, or I think I could answer some parts of this question: ✓
- Our class answered this question, or using the ideas we have developed, I could now answer this question: ✓+

Answer three questions from the DQB using evidence. Have students pick three questions they think the class answered. Tell students to use the space on the handout *Questions from Our DQB* to write down the answer to those questions and back up their reasoning with evidence from the unit.

Review and share the questions that students think we have answered. Present **slide C** and have students share their answers to the three questions with a partner. Pairs should help each other refine their answers using evidence. This is a good way for students to practice sharing responses with a partner before sharing the responses out loud to the whole group, which happens in the next activity section.

Have students mark questions on the DQB with sticky dots. Display **slide D**. Students should walk up to the DQB and put 5 sticky dots on the questions they think the class made progress on.*

Then have students move into their Scientists Circle.

Name: _____ Date: _____

Questions from Our DQB

Look through the list of questions from our DQB. Mark questions you think the class has answered by putting different symbols next to each question.

- We did not answer this question or any parts of it yet ○
- Our class answered some parts of this question, or the ideas we developed help me see how I could now answer some parts of this question ✓
- Our class answered this question, or the ideas we developed help me see how I could now answer this question ✓+

Then pick three questions you marked and write what you think that answer would be.

Question	Answer and Supporting Evidence

Questions from our classroom DQB:
1. (Teacher list here before printing for students.)

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* ATTENDING TO EQUITY

Revisiting the Driving Question Board is important for students to feel as though their questions are valued and recognized. While not all questions will have been addressed (it's more likely that 60–75 percent will be at least partially answered), this helps students see that they have done this hard work to answer many of their own questions.

3 · REVISIT THE DRIVING QUESTION BOARD

25 min

MATERIALS: science notebook, *Questions from Our DQB*, Driving Question Board, space for a Scientists Circle

Look for patterns using the dot stickers. In the Scientists Circle, focus on the questions that have the most number of sticky dots.



Discuss as a class the questions the class can now answer. Present slide E if needed. Have the class discuss the answers to these questions as a group. If you have space, you might make a Take Aways board that has a record of the answers the class comes up with.*

Encourage students to ask questions to help clarify the models the class has built so far. Work through these questions together to clear up the partial understandings.

* SUPPORTING STUDENTS IN ENGAGING IN ASKING QUESTIONS AND DEFINING PROBLEMS

Revisiting the DQB at the end of the unit helps students see the progress they have made toward answering questions that were important to them at the onset of the unit. Students were tasked with asking questions “that require sufficient and appropriate evidence to answer.” Through the investigations in the unit and individual and whole-group sensemaking, they can now answer many of the questions.

This final visit to the DQB also allows students to ask additional questions to seek to clarify the several models the class has built over the unit to answer the driving question, “Why are living things different from one another?” This is an opportunity to help students with partial understandings as they prepare for the summative assessment.

4 · UPDATE OUR PROGRESS TRACKERS

5 min

MATERIALS: Progress Tracker

Add any new insights to the Progress Trackers. Present slide F. During the time students were revisiting the Driving Question Board and working together to answer questions, new ideas or insights may have surfaced for individual students. Have the class update the 2-column Progress Trackers with any additional ideas they think are important.

Prepare for summative assessment.

HOME LEARNING OPPORTUNITY

Any additional preparation students might want to do to prepare for the summative assessment they can do as home learning.



End of day 1

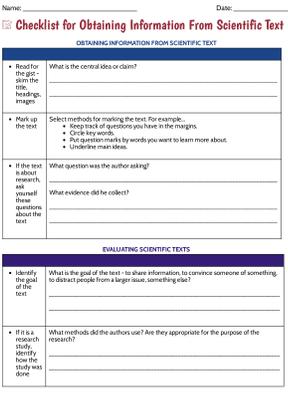
5 · DEMONSTRATE UNDERSTANDING ON AN ASSESSMENT TASK

37 min

MATERIALS: *Summative Assessment, Checklist for Obtaining Information From Scientific Text*

Administer *Summative Assessment* individually to students. This assessment will take students about a full class period to complete. Students will use a checklist to help them obtain and evaluate the information from the text in the assessment to answer several questions. To help students engage with this practice, they can use the *Checklist for Obtaining Information From Scientific Text*.

There are keys to help with scoring the assessment if you choose to do so: *Summative Assessment Key* and *Obtaining Information From Scientific Text Key*.



Name: _____ Date: _____

Checklist for Obtaining Information From Scientific Text

OBTAINING INFORMATION FROM SCIENTIFIC TEXT

• Read for the big idea: slim the big ideas into fragments.	What is the central idea or claim?
• Mark up the text.	Select methods for marking the text. For example: <ul style="list-style-type: none">• Keep track of questions you have in the margins.• Circle key words.• Put question marks by words you want to learn more about.• Underline main ideas.
• If the text is about research, ask yourself these questions about the text.	What question was the author asking? What evidence did he collect?

EVALUATING SCIENTIFIC TEXTS

• Identify the goal of the text.	What is the goal of the text - to share information, to convince someone of something, to direct people from a larger issue something else?
• If it is a research study, identify how the study was done.	What methods did the authors use? Are they appropriate for the purpose of the research?

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6 · QUICK WRITE: REFLECT ON OUR EXPERIENCES (OPTIONAL)

8 min

MATERIALS: science notebook

Have students reflect on their experiences with the unit. They should begin with a quick write on their own in their science notebooks, and then discuss with the whole class.

- What was most challenging in this unit?
- What was most rewarding?
- Think about how you engage in sensemaking discussions with classmates. How would you want to engage with those experiences the next time around?
 - What would you do the same?
 - What would you do differently?

Additional Lesson 16 Teacher Guidance

SUPPORTING STUDENTS IN MAKING CONNECTIONS IN ELA

CCSS.ELA-LITERACY.RST.6-8.4

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6–8 texts and topics*.

Students need to interpret the results for Dr. Chen's research study conducted in 1928. They need to understand this information in order to explain on the assessment how the trait of coloration in goldfish is inherited *Summative Assessment*.