Science Assessment System Through Course Task

Dog Coat Color

Grade Level:
1

Phenomena:
Genetics of Dog Coat Color in Labrador Retrievers

Science & Engineering Practices:
Analyzing and Interpreting Data
Engaging in Argument from Evidence

Crosscutting Concepts:
Patterns

Designed and revised by Kentucky Department of Education staff
in collaboration with teachers from Kentucky schools and districts.

Preparing to implement Through Course Tasks in the Classroom

What is a TCT?

- TCTs are 3-dimensional tasks specifically designed to get evidence of student competency in two dimensions, Science and Engineering Processes (SEPs) and Crosscutting Concepts (CCC), untethered from Performance Expectations (PEs)/standards. Tasks are sense-making experiences.
- Tasks are to be used formatively. The goal is for both students and teachers to understand areas of strength and improvement for the SEP(s) and CCC assessed within the task.

How do I facilitate a Through Course Task (TCT)?

- TCT facilitation is a collaborative process in which teacher teams calibrate understanding of the expectations of the task and refine strategies to be used during task facilitation.

Before the task:

1. Complete the TCT as a learner – compare understanding of task through the lens of success criteria (identified in the task) in order to understand expectations.
   Success criteria include:
   - What is this task designed to get evidence of?
   - What is the task asking the students to do?
   - What might a student response look like?
2. Identify the phenomenon within the task. Consult resources to assure teacher teams have a deep understanding of associated science concepts.
3. Collaborate to generate, review and refine feedback questions during facilitation.
4. Identify potential "trouble spots" and plan for possible misconceptions.

During the task:

5. Collect defensible evidence of each student's competencies in 3-dimensional sense-making for the task.
6. Ask appropriate feedback questions to support student access and engagement with the task in order to elicit accurate evidence of student capacities.

After the task:

7. Reflect on the task as a collaborative team.
8. Review student work samples to identify areas of strength and areas of need.
9. Determine/plan next steps to move 3-D sense making forward through the strengthening of the use of SEPs and CCCs.

Using the materials included in this packet:

- **Task Annotation:**
  - The task annotation is a teacher guide for using the task in the classroom. Additionally, the annotation gives insight into the thinking of developers and the task overall.

    - Each task has science and engineering practices, disciplinary core ideas, and crosscutting concepts designated with both color and text style:
        - **Science and Engineering Practices**
        - *Disciplinary Core Ideas*
        - Crosscutting Concepts
- **Student Task:** The materials to be used by students to complete the TCT.

Dog Coat Color Task Annotation

After **analyzing and interpreting data** about the *coat color of a puppy for various coat color combination from the parents*, **make a claim** about the *potential coat color* using the patterns in the data as **evidence to support the claim.**

Phenomenon within the task

A dog's coat color is determined by genetics. By looking at the coat color of parents, we can predict the color of the offspring. For this task, we looked at dominate genes only. To keep the data size small, and to avoid confusion, we did not factor in recessive genes. Although the data is true, other color combinations would be possible if we included the impact of the parents' recessive gene. For example, two black Labrador retrievers would have a 25% chance of producing a puppy with a yellow coat if both parents have the yellow coat recessive gene as shown in this Punnett Square.

Punnett Square for Black Labrador Retrievers with yellow coat recessive gene.	 Father's dominant gene	 Father's recessive gene
 Mother's dominant gene	 Coat color for mother's and father's dominant genes.	 Coat color for mother's dominant gene and father's recessive gene.
 Mother's recessive gene	 Coat color for mother's recessive gene and father's dominant gene.	 Coat color for mother's and father's recessive genes.

How the phenomenon relates to DCI

LS3.A Organisms have characteristics that can be similar or different. Young animals are very much, but not exactly, like their parents and also resemble other animals of the same kind. Plants also are very much, but not exactly, like their parents and resemble other plants of the same kind.

LS3.A is part of the standards for 1st grade, and then goes deeper in 3rd grade. In 3rd grade, the influence of the environment comes into play.

What information/data will students use within this task?

Students will use a chart that provides data related to coat coloration of adult dogs and their offspring.

Note to teachers: The genes for the black coat color are the most dominate, brown being the next dominate and yellow coat color being the least dominate. Students are not expected to know what the term dominate is, or use the term when talking about the task. However, you may find it helpful to use the appropriate vocabulary and explain to students that it means the "*most likely result.*" A dominant gene should not be referred to as the stronger gene as this contributes to later misunderstandings.

Students may not be familiar with Labrador retrievers. Teachers may need to share pictures and a bit of background on the dog breed. This information is not necessary for students to complete the task.

Ideas for setting up the task with students

Activate prior schema by discussing prior experiences with puppies. Has anyone ever had a dog that had puppies? What did they look like? Did they look just like the mother dog? Do babies (humans and/or animals) look like their parents? What was the same? What was different?

Examples might include, "I saw a blue bird's nest last spring and the when the eggs hatched, the babies looked just like the mother bird in some ways." "My mom and dad both have brown hair and brown eyes. My sister and I both have brown hair and brown eyes too!"

Teacher note: Typically, we think of patterns in the format of ABAB, ABBA, and many others. These early understandings of patterns are important and a concrete way to approach the question "what comes next?" Pushing students to see patterns in an abstract

way is a challenge, but can help them to discover and interpret complex patterns. This is vital to critical-thinking skills that students need to develop.

Intent of the Task for Assessment

This task provides evidence of early learners' ability to analyze data to identify patterns, and use the patterns in the data to make predictions (argumentation).

The first 3 questions of this task are straightforward interpretation of the data chart, and the subsequent questions have a deeper cognitive level.

- Questions 1-3 Students use the exact information from the given chart to answer. Student makes a claim(s) about the coat color of a puppy for various combinations of parent coat colors based on patterns in the data. (There is not explicit evidence that students use the patterns based on student response for parts 1-3. A teacher could verbally probe for that information.)
- Question 4 Students use information in the data set to reason what is NOT directly evident from the chart.
- Question 5 provides evidence for a general synthesis of the information in the chart, and provides evidence of the students' ability to describe a pattern. For question 5, a student makes a claim about puppy coat color when the mother has a brown coat and the father's coat color is unknown, using patterns in the data as evidence to support their claim. Students will answer questions about what color coat a litter of puppies might have based on the parents' coat color. Student will use evidence from the data to support their claim.
- Question 6 provides evidence for general synthesis of the information in the chart. Students use the data to determine what color of puppy is most common.
- The task extension asks students to use their analysis of the table in an inverse way from the task. Rather than predicting the resulting puppy based on the parent colors, the parent colors are predicted based on the puppy color.

One thing that may cause confusion is that most questions offer the opportunity to color 2 puppies when only one color is a possibility. The questions were structured in this way so that the students are not "cued" that only one color puppy is possible, so the teacher will need to explain this to the students. (You may need to address this multiple times because the possibility occurs more than once). You may choose to have students color both puppies the same color, if needed. An alternative to this would be to

provide all color choices as possible answers for students to select from. (e.g., Black Brown Yellow -- Circle those that answer the question.)

Success Criteria

Evidence of Learning Desired based on Progression from Appendices

Analyzing and Interpreting Data

- Use observations (firsthand or from media) to describe patterns and/or relationships in the natural world in order to answer scientific questions and solve problems. (Appendix F)

Engaging in Argument from Evidence

- Construct an argument with evidence to support a claim. (Appendix F)

Crosscutting Concepts – Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (Appendix G)

Success Criteria

- The student identifies possible coat color outcomes based on the parents' coat colors as presented in the chart.
- The student explains how the pattern presented in the coat color chart supports their identification of puppy coat color.

Possible Student Responses

Look fors:

- Students use data from the chart to support their response.
- Students reference patterns they observe in the data to support their answers (claims).

- Students explain the pattern and tell how they were able to determine the color of the puppy based on the pattern.

A sample response might be "I looked at each row in the chart and learned that almost all of the puppies were the same color as the mother. Only two puppies were not. So I think this puppy will probably be the same color as the mother as well. There are other possible patterns that students could use to support their color choice. It is important to understand their reasoning. There is not one correct answer.

"If you want a puppy who has a yellow coat, you would have to have parents whose coats were both yellow too."

Other information teacher teams might find useful when preparing to use this task in the TCT process

https://betterlesson.com/home 1st grade science unit: "Who's Your Animal Parent?" The Big Idea is: Do all animal babies look like their parents?

Also in betterlesson.com, Similarities & Differences. Big Idea: The students will discover animal babies look very similar to their parents.

Both of these resources will help students develop their thinking about how offspring resemble the parents. It is not necessary, but you may find that it's helpful if your class struggles with this concept or lacks the schema needed. They can also serve as extension activities, allowing students to dig deeper and have richer conversations.

Extensions and/or other uses after the task is implemented

With some intentionality this task may provide evidence about the following math and literacy standards:

> *CCSS.MATH.CONTENT.1.MD.C.4 Organize, represent and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category and how many more or less are in one category than in another.*
>
> *CCSS.ELA-LITERACY.SL.1.2 Ask and answer questions about key details in a text read aloud or information presented orally or through other media.*

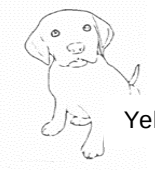
Students will be asking and answering questions about information presented through a chart. The teachers will also orally present the information found on the chart.

Students will have to look at the key details (color of the parents and the color of the puppies) to answer the questions.

This is not a direct link or an assessment of these standards, but a chance to observe if lessons on this standard are understood and being applied across the content. Being able to find the key details, or the information that is importation is difficult. Practice doing so in charts, posters and handouts is needed.

Through Course Task – Dog Coat Color

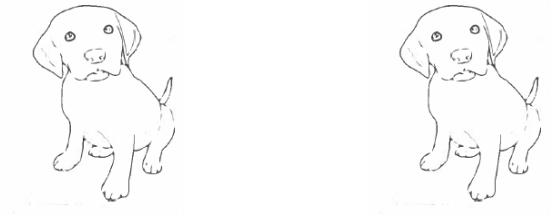
Parents' Coat Colors		Puppies' Coat Colors
Mother	Father	
		
		
		 
		
		
		

Parents' Coat Colors		Puppies' Coat Colors
Mother	Father	
 Brown	 Black	 Black
 Black	 Yellow	 Black
 Brown	 Yellow	 Back  Brown
 Brown	 Brown	 Brown
 Black	 Black	 Black
 Yellow	 Yellow	 Yellow

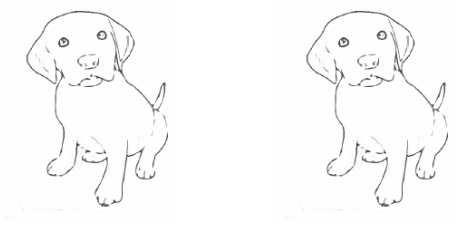
Name:_____

Answer the questions using information you gathered from the chart. Some questions have only one possible answer even though there are two puppies.

1. What coat color would a puppy have if the mother had a brown coat and the father had a yellow coat?



2. What color coat would a puppy have if the mother had a black coat and the father had a yellow coat?



3. What color puppies would you expect to see if the mother has a brown coat and the father has a black coat?

4. If the mother has a brown coat and the father has a black coat, what colors would you NOT expect to see?

5. If the mother has a brown coat, what color coatswould you expect the puppies to have?

How does the pattern in the chart help you to know that?

_____

_____

_____

_____

_____

6. What coat color is the most common?

Extension

There is a color option or a B&W option that students can color before they answer the question.

I choose to print several copies (color the B&W or print the colored version) and put them in binder sheets for students to take back to their seat when they are ready for the extension.

Sam went to the pet store with his mom. Sam saw lots of dogs! He saw 4 big dogs that were the parents to all the puppies. There were 2 yellow parents, 1 brown parent, and one black parent.
Sam saw a yellow puppy and told his mom, “I know who the mommy and daddy are for that puppy!” Sam’s mom ask, “How do you know?”

Explain how Sam knows which dogs are the yellow puppy's mom and dad.

The mom is  and the dad is 

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