

Grade 1 Bio-fabrication Storyline

Puppies!

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Synopsis:

This unit begins to develop concepts of life science with the youngest of students. It provides a series of experiences using puppies that will build not only on the conceptual understanding of inherited traits but will begin to scaffold in scientific and engineering practices.

What Students Figure Out:

- Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. (1-LS1-1)
- Patterns in behavior of parents and offspring help offspring survive. (1-LS1-2)
- Make observations about observable patterns that helps them to construct an evidence-based account for how young animals are very much, but not identical to, their parents (a natural phenomena). (1-LS3-1)
- Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem (K-2-ETS1-2 Engineering Design)



LS1 Structure, Function, and Information Processing

Students who demonstrate understanding can:

1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

* [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.]

1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.

[Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).]

1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

[Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.] [Assessment Boundary: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.]

K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices Developing and Using Models

Modeling in K-2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-LS3-1)
- Use materials to design a device that

Disciplinary Core Idea

LS1.A: Structure and Function

- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1)

LS1.B: Growth and Development of Organisms

- Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (1-LS1-2)

LS1.D: Information Processing

- Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2), (1-LS3-1)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (1-LS1-1), (K-2-ETS1-2)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Every human-made product is designed by applying some knowledge of the natural world and is built by using materials derived from the natural world. (1-LS1-1)

solves a specific problem or a solution to a specific problem. (1-LS1-1) Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information. - Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1 - LS1-2) Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence - Scientists look for patterns and order when making observations about the world. (1 - LS1-2)	some external inputs. (1-LS1-1) LS3.A: Inheritance of Traits - Young animals are very much, but not exactly, like their parents. Plants also are very much, but not exactly, like their parents. (1-LS3-1) LS3.B: Variation of Traits - Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. (1-LS3-1) ETS1.B: Developing Possible Solutions - Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K -2-ETS1-2)	
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Progression	Questions	Phenomena	Lesson Performance Expectation Build	Activity	What we figured out
Anchoring Phenomena	How many ways can we sort dogs?	Dogs look similar but also look different	Make observations to construct an evidence-based account that young animals are like, but not exactly like, their parents. (1 LS-3-1) Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. (1 LS1-1)	Introductory activity. Students work in teams of 2-3 and sort all dog pictures in their own way. After sorting, there is a gallery walk or an orchestrated sharing of sorts. Can you guess how the dogs were sorted?	There are many different ways to sort dogs, Typically we sort them by their TRAITS.
Establish a Driving Question Board (DQB)	How can dogs look similar, but also look different?	Develop a DQB		Brainstorm a list of questions about how dogs look similar (the same) but also different. Record these questions and share them on the classroom DQB Sort the questions into categories that make some sense (questions about traits, anatomy, behavior, training, survival, form, function, etc.)	As a class, we are interested in learning about dogs and we have lots of questions about them.
Lesson 1	How do offspring (puppies) differ from their parents?	Puppies look similar to their parents and siblings, but puppies are not exactly like their parents or their siblings (brothers & sisters)	Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. (1 LS1-2) Make observations to construct an evidence-based account that young animals are like, but not	Begin with exposure to puppies through fiction and non-fiction literature including parent/offspring behaviors (LS1-2). See Literature Links and Puppies Presentation.	A litter of puppies shares many common traits. A litter of puppies will have a few divergent (not the same) traits. Add to Summary Board

			exactly like, their parents. (1 LS-3-1)	Observe (visually with lots of discussions) many specific litters of puppies. Brainstorm a list for 5 litters and post in the class: what attributes (traits) are in most offspring/which traits appear in just a few puppies? After a good amount of exposure to photos/media of dogs and their offspring, students make observations about the traits for puppies of 2 parent dogs.	
Lesson 2	Can we use traits to identify (match) puppies to their parent dogs?	Matching Puppies to Their Parents Activity	Make observations to construct an evidence-based account that young animals are like, but not exactly like, their parents. (1 LS-3-1)	The teacher shares many parent pictures. Students have a multitude of puppy pictures. Matching activity; can be done in small groups or the whole class. Which of the puppies might match this parent pair? Explain your reasoning. Determining what are common TRAITS of dogs and puppies, shared amongst all in a litter. Identify by making observations of some divergent traits.	Traits help us identify a puppy that may come from a pair of adult dogs. A puppy is similar to its parents, but is not exactly like its parents. Add to Summary Board
Lesson 3	Can you predict and build a model of a puppy that might be born in a litter of	Build a Puppy Activity (Share a photo of a pair of adult dogs. Ask the	Make observations to construct an evidence-based account that young	A pair of adult dogs are displayed clearly in the classroom. The traits of	We can predict and then create models of puppies that might be born to a

	an identified pair of adult dogs?	students to predict what their puppies might look like, create models of these offspring).	animals are like, but not exactly like, their parents. (1 LS-3-1)	the dogs are discussed. Have students model the offspring by “Building A Puppy”. Display the adult and “litter” in the classroom for the entire unit.	litter from looking at traits of the parents. Add to Summary Board
Lesson 4	How do traits of specific dog breeds help them solve problems and survive?	Share photos of dogs and/or puppies with common-place dog traits (ear shape, ear size, type of fur, length of fur, type of paw, type of snouts, length of legs, etc). Every child picks one picture. Each child identifies one attribute by circling it on the picture. How does that attribute help that dog move, find food, stay warm, swim or solve a different problem?	Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. (1 LS1-1)	Classification activity. Observe the most common puppies/dogs’ attributes asking what traits resolve the issues of the dogs.	Some traits help a puppy and/or a dog solve problems and survive. (Not usually part of the Summary Board; this is where students take their understanding of traits and apply that to a biofabrication engineering challenge)
Lesson 5	Can we design then draw and/or construct a model of a dog trait that might help some humans?	Design a model of a dog trait that might help some humans	1-LS1-1. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs. (1-LS1-1) Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. (K-2-ETS1-2)	Identify a problem of humans that could be solved by adopting a trait that dogs commonly have. Think about the shape of a trait; could it help a human? Draw or build a simple model of this invention (diagram with labels or out of scrap materials). Be ready to demonstrate and tell the class what problem is being solved by your design	When we can think creatively, we can do the work of an engineer and design then model a solution to a human problem. (Not usually part of the Summary Board; this is where students take their understanding of traits and apply that to a biofabrication engineering challenge)

				Provide materials for drawing or constructing a simple model.	
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