San Diego Zoo
Wildlife Explorers

Sensational Scientists

Teacher Resources & Activities
Fourth Grade

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Curriculum Guide

The five traditional senses help us to gather vast amounts of information from our environments - sight, hearing, taste, touch, and smell. A sense is broadly defined as "a specialized function or mechanism by which an animal receives and responds to external or internal stimuli". The five senses in humans are sufficient to gather information about the world around us in order to survive, but some other species have senses that reach far beyond those of humans. The senses of animals, in particular, help them to navigate through their environment, to find and recognize mates, stay connected with the group, avoid danger, and find or hunt food.

This curriculum was created for and aligns with our 4th grade grant-funded Sensational Scientists program. This three-part program is offered to Title 1 schools across San Diego County. The activities are designed to support learning before and after your participation in this program, but can also stand alone in any 4th grade classroom as supporting activities to meet the standards listed below. The activities in this booklet allows you and your students to observe and document the various ways wildlife use their senses to navigate and understand their world. For children, relating their senses with other plants and animals, especially native species, helps them to build a personal relationship with the natural world and inspires empathy.

COMMON CORE STANDARDS FOR CALIFORNIA PUBLIC SCHOOLS

To build a foundation for college and career readiness, students need to learn to use writing as a way of offering and supporting opinions, demonstrating understanding of the subjects they are studying, and conveying real and imagined experiences and events. In addition, students must have ample opportunities to take part in a variety of rich, structured conversations— as part of a whole class, in small groups, and with a partner. Activities in Sensational Scientists correlate with the following standards:

- ELA/Literacy W.4.1: Write opinion pieces on topics or texts, supporting a point of view with reasons and information (4-LS1-1)
- ELA/Literacy SL.4.5: Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-LS1-2)
- Mathematics 4.G.A.3: Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)

NEXT GENERATION SCIENCE STANDARDS FOR CALIFORNIA PUBLIC SCHOOLS

Activities in Sensational Scientists correlate with the following performance expectations:

- 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways

Pre-Visit Activities

SENSORY WALK

INTRODUCTION

Animals are constantly sending and receiving sensory messages in order to successfully accomplish many key aspects of survival, including finding food, avoiding danger, finding/staying connected to other members of their species, and claiming or defending their territory. For humans our senses play a huge role in our everyday lives, however, most of the time we are not aware of our own reflexes, or involuntary responses. Students will be examining how their body takes in information and their involuntary actions as a result of the information received from their senses.

OBJECTIVES

Students will discuss the connection between structure (e.g., eyes) and function (e.g., sight).

Students will identify the sensory inputs and behavioral outputs they experience on a walk.

MATERIALS

- A walking path
- Notebooks (optional)
- Pencils
- Did You "Sense" That? worksheet

HELPFUL TIP
When planning your walk, think about where you can pass by multiple engaging places, e.g. trash can, signs, loud spaces, different substrates, etc.

ACTIVITY

Step 1: Review the five senses and the process through which the brain receives information and responds. What is the structure that allows us to perceive these senses? When ready, begin a class discussion on what senses they expect they would rely on the most during a walk. Tell students they will be going on a walk and their job is to focus on what senses they notice being used. When they return from the walk, their challenge will be to record as many sensory experiences as they can!

NGSS Performance Expectation 4-LS1-1 & 4-LS1-2

ACTIVITY, CONTINUED

Step 2: Lead students out of the classroom on a walk. Try to incorporate as many of the following elements into the walk as possible. When finished return to your classroom for notetaking and discussion.

Touch	• Try to switch substrates on the walk (e.g. dirt to concrete) • Air conditioning vs. none • Sunshine vs. shade • Materials (e.g. wood, plastic, metal)
Smell	• Unpleasant (e.g. trash cans) • Pleasant (e.g. kitchen) • Neutral (e.g. plants)
Hearing	• By other classrooms • Road sounds • Speakers/sound systems • Alarms
Sight	• Signs • Colors • Closed/open doors • Dark to bright
Taste	• Personal preference (e.g. finding a suitable plant and telling the kids they can taste it or not) • Water fountain

Step 3: Upon return to the classroom, instruct students to begin recording as many sensory experiences, or stimuli, as they can on their Did You "Sense" That? worksheet. This would include any time they received information through their senses.

TIP: If preferred, work as a class to list all the stimuli on the board. Pick one and work through the interaction as a class focusing on what sensory structure was used, what the response is, and finally how that might help us survive.

Step 4: Using the Did You "Sense" That? worksheet, have students choose their favorite sensory experience and work through the same questions: what sensory structure was used, what the response is, and finally how that might help us survive.

ACTIVITY, CONTINUED

Step 5: Discuss how their brain processed information by recording the response and memory.

Ask, can anyone think of a memory regarding a sensory moment from today?

- For example, “Every time I walk and see/feel those yellow bumps on a sidewalk, I know to stop and look for cars before I keep walking. That’s because I remember doing it with adults when I was little and learned it keeps me safe.”

EXTENSIONS

1	Have the students pair up and “give up” one of their senses relying on their partner to help them navigate if needed. Afterwards discuss the experience and what was easier or harder.
2	Go on a second sensory walk. Have a group discussion during the walk about the sensory information you are receiving now that everyone is more comfortable identifying them through their senses.

Name _____ Date _____

DID YOU "SENSE" THAT?

Note, in the first row, information you received from your five senses while on our walk.
If you noticed a response, note what structure was used and if there was a response in the second row.
When finished, brainstorm in the last row the function of the structure and how it might help us survive.

TOUCH	SIGHT	HEARING	SMELL	TASTE

STRUCTURE & RESPONSE

HOW MIGHT THIS HELP US SURVIVE?

STRUCTURE & FUNCTION

INTRODUCTION

Students explore different external structures and how they function to help plants and animals survive. Many animals and plants have similar structures but by taking a closer look at some of the differences, students can gain a deeper understanding of how different structures work together to help an animal find food and water, grow, avoid predators, or reproduce

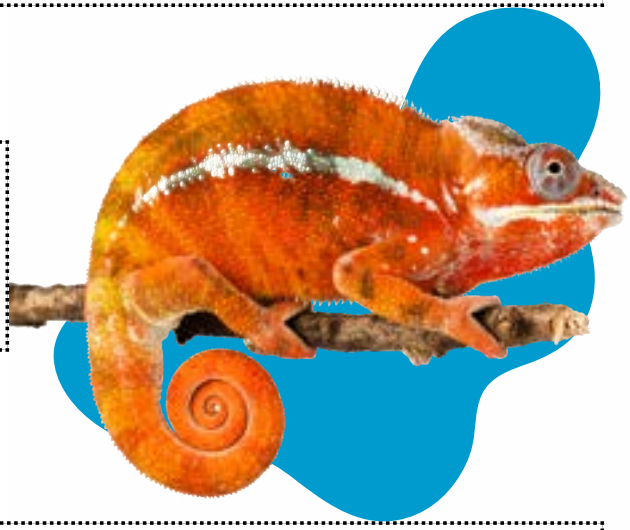
OBJECTIVES

Students will identify an important structure to an animal and how it helps their animal survive.

Students will compare similar structures on different animals and identify how the same structure could provide different functions based on the needs of the animal and its habitat.

MATERIALS

- Short Animal Videos
- Pencils
- Colored pencils (optional)
- Copies of Structure and Function Worksheet



ACTIVITY

Step 1. To begin this activity, work together as a class to review our key concepts: structure and function.

Step 2. Option 1: Put the discussion into practice by watching a short animal video and instructing students to closely observe the wildlife in the video for structures it relies on. See the Curriculum Resources section for all links. Discuss some of the structures they noticed that help the animal. What is their evidence?

NGSS Performance Expectation 4-LS1-1

ACTIVITY, CONTINUED

Step 2. Option 2: If the class is struggling to make connections between structure and function, watch the short video on Stuart the Fishing Cat (0:00-1:35) which provides an explanation between structures (e.g. webbed feet, whiskers) and their functions to model what students might observe and how to connect it to survival. Video link is in Curriculum Resources, under San Diego Zoo Videos.
Step 3. Either with a new animal, or with an animal already discussed, students will start to fill out their Structure and Function worksheet by drawing their animal of choice. If they have extra time, they can add color at the end.
Step 4. Instruct students to list out as many of the structures they saw. When finished, choose one to focus on and draw the structure with as much detail as possible. Students should also record what function their structure helps the animal perform.
Step 5. Watch one of the other provided videos and have students record how the same structure may function differently for that animal.

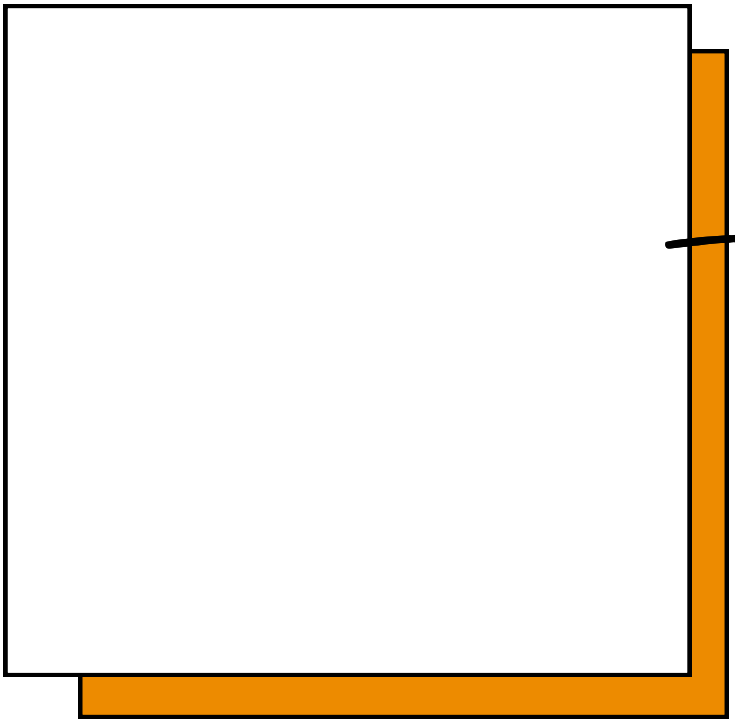
EXTENSIONS

1	Focus on functions instead of structures. Try and find how structures differ from animal to animal but still provide the same function.
2	Focus on the internal structures that help an animal survive. Students can research what internal structures or systems different plants and animals have based on their needs.
3	Create a play/video/short story about an animal focusing on how its structures help it survive.

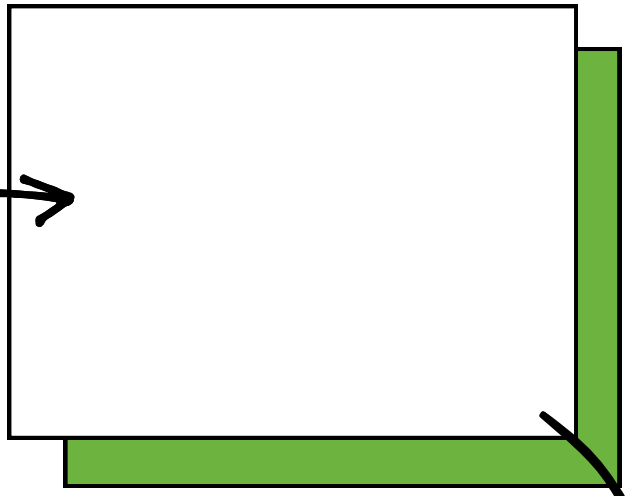
Name _____ Date _____

STRUCTURE & FUNCTION

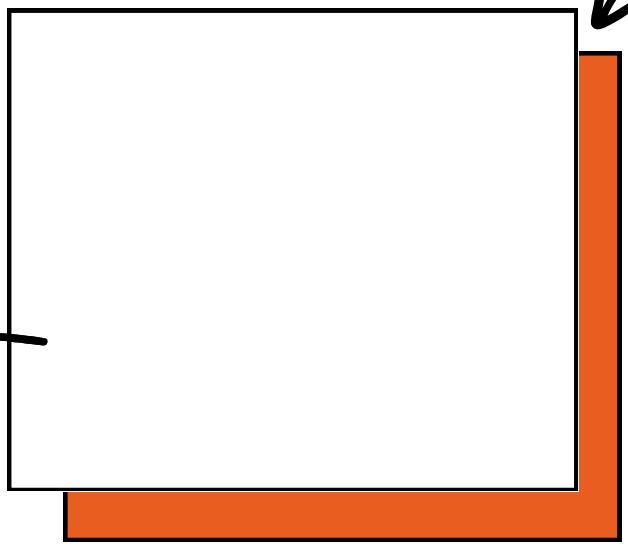
DRAW YOUR ANIMAL



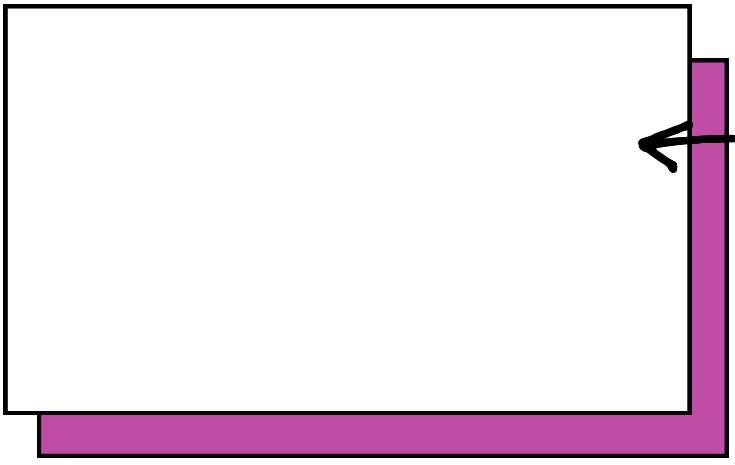
STRUCTURES THAT HELP MY ANIMAL SURVIVE



DRAW A CLOSE UP OF ONE OF THE STRUCTURES



I KNOW THIS STRUCTURE HELPS MY ANIMAL BECAUSE....



THIS STRUCTURE HELPS OTHER ANIMALS SURVIVE TOO...

ANIMAL	FUNCTION

DESIGN CHALLENGE

INTRODUCTION

Plants and animals have been inspiring inventions for centuries. In a well-known example, the structure and function of burdock burrs led to the creation of Velcro. Students will tap into their creative side and be inspired by some of their favorite wildlife and the ways they can help humans by designing a product inspired by nature.

OBJECTIVES

Students will identify important structures of their favorite animal.

Students will describe the characteristics and function of the structures they observe.

Students will create a product inspired by the structures and functions they observe.

MATERIALS

- Pencils
- Colored pencils, crayons or markers
- Sample Design
- Copies of the Design Challenge worksheet

ACTIVITY

Step 1: Start by leading a class discussion to review the ideas of structure and function. Practice characterizing a structure in your classroom to really focus on the details that make that structure unique and how that translates into a certain function.

Step 2: Distribute the Design Challenge worksheet. Tell students they will be using their favorite plant or animal to help them create a design for a product based on the structures they observe. Review the example of the pangolin-inspired backpack, explaining each of the section.

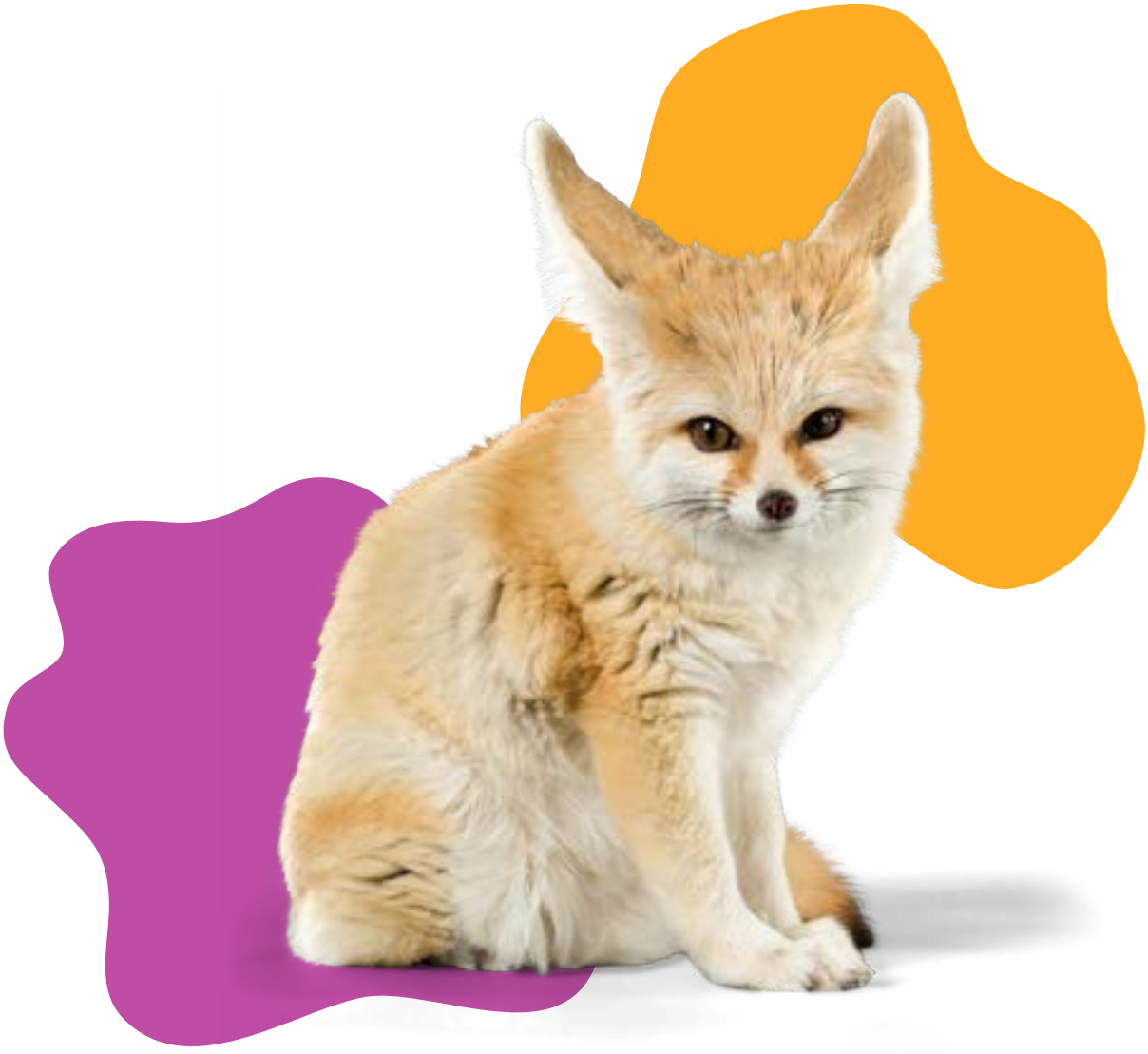
NGSS Performance Expectation 4-LS1-1

ACTIVITY

Step 3: Host a gallery walk so that students can see each other's designs. You can hang up their ideas or have them present them to the class if desired.

EXTENSIONS

1	After completing their design, students can develop a Shark Tank inspired product pitch to present. They will be tasked with thinking about the benefits, a theme or slogan, how they would tell others about the product, budget, etc.
2	Make a prototype.



Name _____ Date _____

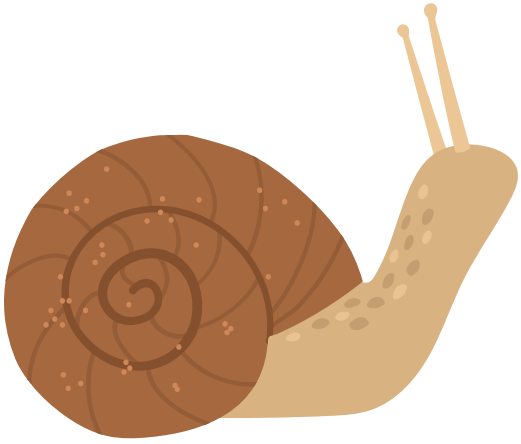
SAMPLE

DESIGN CHALLENGE

IMAGINE

Think about your favorite plant or animal. You've been given the opportunity to study your it and design a product based on its structures!

DRAWING



THINK BOX

What do I know about my plant or animal?

- Snails are mollusks
- Snails make their own shells with an organ called a mantle
- The shell protects and supports their soft body inside
- They stay in their shells for their entire life and continue to add to them

IMPORTANT STRUCTURES

How does this help them survive?

- Shell - made of calcium carbonate, with spirals made throughout its life; protective
- Foot - the base of the snail's body; moves by making contractions and expansions
- Eyes - at the tip of their tentacles, helps them see obstacles or predators nearby; can move their eyes without moving their bodies

BRAINSTORM

This plant/animal inspires me to create...

- Spiral staircase
- Defense mechanism against intruders
- Compact

Name _____ Date _____

DESIGN CHALLENGE

IMAGINE

Think about your favorite plant or animal. You've been given the opportunity to study your it and design a product based on its structures!

DRAWING

THINK BOX

What do I know about my plant or animal?

IMPORTANT STRUCTURES

How does this help them survive?

BRAINSTORM

This plant/animal inspires me to create...

Post-Visit Activities

MY SECRET PLANT

INTRODUCTION

Nature journaling does not have to end after the completion of the Sensational Scientists program! Nature Journaling encourages students to explore and investigate the world around them focusing on describing what they observe. In this activity students will build on their journaling skills to carefully record their observations of a plant. A partner will then be challenged to identify the plant using their notes.

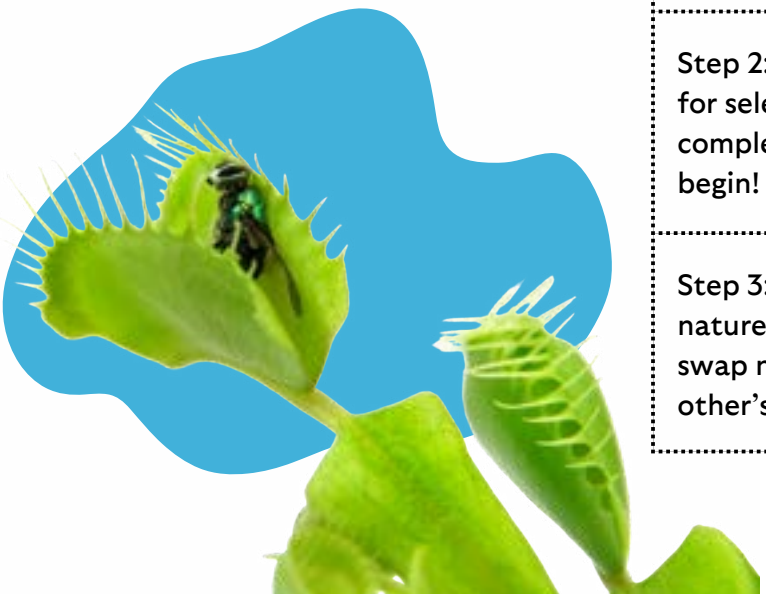
OBJECTIVES

Students will identify important characteristics that are distinctive to their plant.

Students will use the clues in a partner's nature journal to locate the plant described.

MATERIALS

- Pencils
- Colored pencils (if time permits)
- Sample Nature Journal worksheet
- Nature Journals or paper
- Outdoor space with a variety of plant life



ACTIVITY

Step 1: Introduce the challenge. Students will create a nature journal entry of a plant that a classmate will use as clues to find the plant!

Step 2: As a class, create an example nature journal entry that includes a drawing, words, and numbers. Have students suggest what details are important to include that would help someone find their plant.

Step 2: When read, tell students the boundaries for selecting their plant and their time limit to complete their journal. When they are ready, begin!

Step 3: After students have completed their nature journals have them find a partner and swap nature journals to see if they can find each other's plants.

NGSS Performance Expectation 4-LS1-1

ACTIVITY

Step 4: After everyone has successfully identified a partner's plant, lead a class discussion on their strategies and observations.

- Did everyone find a secret plant?
- What did you enjoy about this activity?
- What were some of the details that helped you find the plant?
- What might be important to put in your journal in the future?

EXTENSIONS

1	Continue Nature journaling! There are many other nature journaling activities such as Zoom in/Zoom out, String Safari, and Event Comic which are linked in the teacher resources.
2	Have students continue to make observations of their plant over time. Does their initial nature journal description match their plant in fall, winter, spring and summer?

SAMPLE NATURE JOURNAL

THINGS YOU MIGHT INCLUDE:

- Drawing
  - Color
  - Details
  - Small map
- Words
  - Labels
  - Statements or questions like, “I notice...”, “I wonder...”, and “It reminds me of...”
- Numbers
  - Time and date
  - Size/scale
  - Count

DESIGN AN ANIMAL: THE DIM EFFECT

INTRODUCTION

In order to create realistic characters, artists like animators often research their subject matter to understand the details of how the animal moves and what it looks like. Tapping into this creative inspiration, students will design a fictional animal with realistic structures that enable it to survive well in a desert, tundra, rainforest, ocean, or grassland habitat. They will draw an explanatory model of the animal to explain how the specialized structures of the animal work as a system to support the animal's survival in the specified ecosystem. The explanatory model also includes the animal's habitat and explains how the surrounding plants have specialized structures for surviving in the specified habitat.

OBJECTIVES

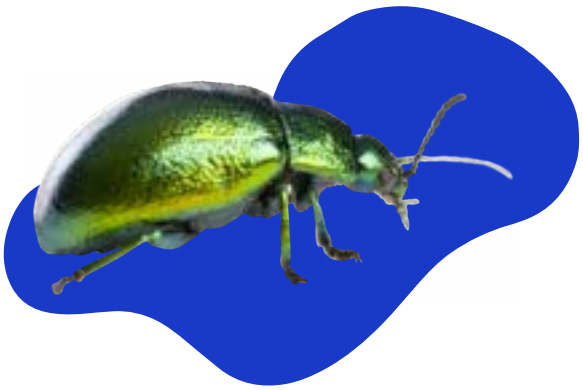
Research a habitat to understand the key characteristics of the ecosystem.

Investigate the adaptations of plants and animals that can survive in this habitat.

Design a realistic animal and explain how the structures of their animal will help them survive in a specified habitat.

MATERIALS

- Pencils
- Internet access and/or research resources
- Drawing with David Video
- Design an Animal worksheet



ACTIVITY

Step 1. Introduce the concept of animal or character design. Use the following prompts to begin a class discussion around the topic:

- What are some of your favorite animated characters?

NGSS performance expectation 4-LS1-1

ACTIVITY

- How do you think animators create animals that seem lifelike?
- Watch the video, Drawing with David listed in the Curriculum Resources. Ask the students to think-pair-share what they learned from the video.

Step 2. Show pictures of Dim from A Bug's Life - The Dim Effect page. He was initially designed to mimic a rhinoceros beetle, but the shape of his horn was creative design; there were no known beetles with that horn shape. Eight years after A Bug's Life was released, a new beetle species was found, Megaceras briansaltini, which had a similar horn shape to Dim. When humans imagine a species that is later discovered to already exist, we call that the Dim effect. Every year scientists discover new species. Your challenge to is to create an animal that is so realistic it could exist. So, what information do you need to know in order to create your animal?

Step 3. Research. To build their background on the habitat and needs of the animal, ask students the following questions. They should record their answers on their Design an Animal worksheet and use it to brainstorm. Set a time limit for this step.

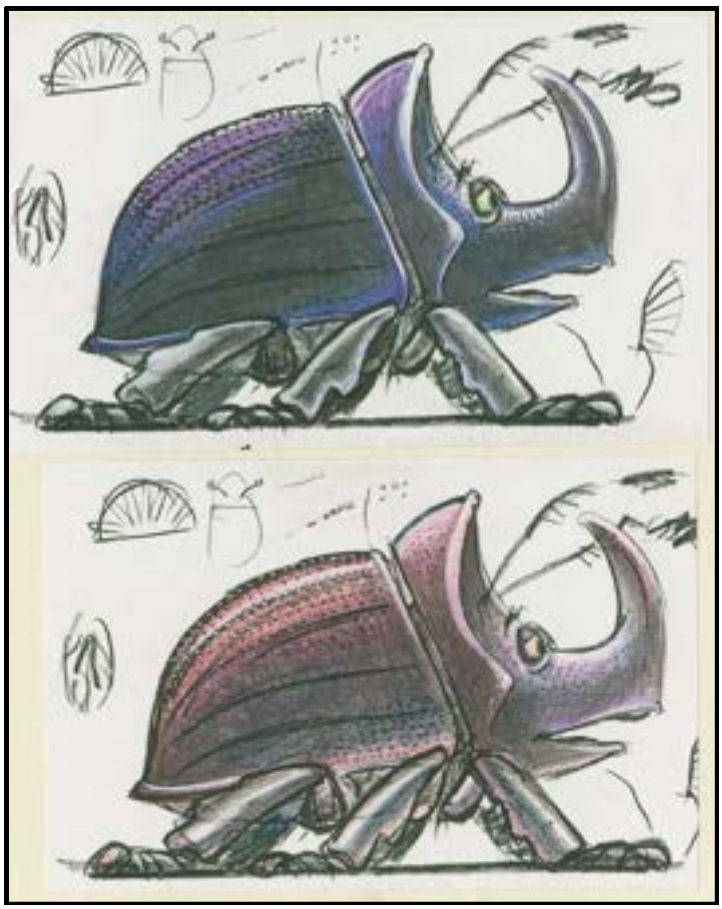
- What kind of habitat would your animal live in?
- What are some of the most important characteristics of that habitat?
- What are some of the adaptations that animals or plants in this habitat need to survive?

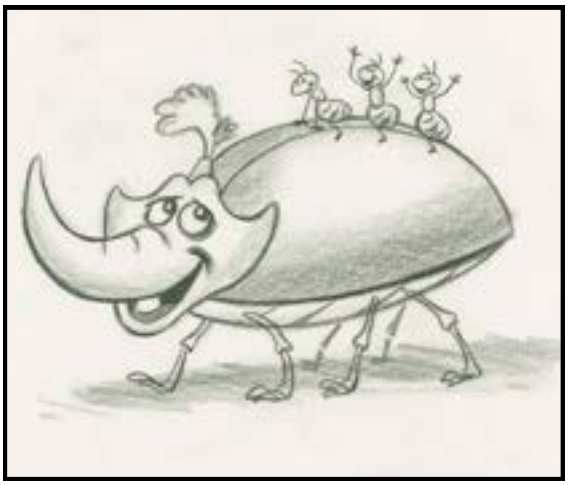
Step 4. Tell the students to take all the information they have gathered and begin their design. Students should include information on what adaptations, structures, or systems they are including and why.

EXTENSIONS

1	Create a comic strip using their newly designed animal to describe a day in their life.
2	Try to discover your own new species by recording observations of any wildlife you encounter. iNaturalist is a great resource in addition to nature journaling!

THE DIM EFFECT





Name _____ Date _____

DESIGN AN ANIMAL: THE DIM EFFECT

HABITAT: CIRCLE ONE

DESERT GRASSLAND RAINFOREST OCEAN TUNDRA

HABITAT RESEARCH

ADAPTATIONS/STRUCTURES

BRAINSTORM

MY ANIMAL

Bonus: What's it called?

Curriculum Resources

VOCABULARY

KEY WORDS	DEFINITION
Basic Need	What an animal or plant must have in order to live - food, water, and protection
Dim Effect	When something that humans imagine, is later found to already exist in nature
Evidence	Something you can see, hear, smell, touch, or taste, or use a tool to measure
Function	How a structure works to help an animal or plant survive and grow
Grow	To get bigger over a period of time
Habitat	The place where a plant or animal normally lives and grows
Investigate	To study something to learn more about it
Notice	To become aware of something
Pattern	Something that repeats in a way you can make a good guess at
Plants	Living things that make their own food
Protect	To keep someone or something from danger
Scientist	A person who studies our world in order to explain why things happen
Sense	Something that allows an animal to get information about the world. They include seeing, hearing, tasting, smelling, and feeling
Structure	The parts of a living thing that help it survive and grow

CURRICULUM LINKS

SAN DIEGO ZOO VIDEOS

San Diego Zoo. (2020, Jan 20). Koala doggos help researchers find wildlife after fires [Video]. Streaming Service. https://www.youtube.com/watch?v=rycEg4VdtQo

San Diego Zoo. (2020, June 23). Underwater flamingo feeding [Video]. YouTube. https://www.youtube.com/watch?v=-1BF2XqboOo

San Diego Zoo. (2020, Aug 18). Drawing with David [Video]. YouTube. https://www.youtube.com/watch?v=MpGNRJFQzzA&t=346s

San Diego Zoo. (2022, Oct 13). Maned wolf [Video]. YouTube. https://www.youtube.com/watch?v=KQ4Mc8vEoro

San Diego Zoo. (2022, Nov 7). There's no day like a snow day for grizzly bears Scout and Montana [Video]. YouTube. https://www.youtube.com/watch?v=dd5VVtcb2FE

San Diego Zoo. (2022, Dec 1). With leafcutter ants, size matters [Video]. YouTube. https://youtu.be/3PTnvXv4GwQ

San Diego Zoo. (2022, Dec 3). Over the moon with baboons [Video]. YouTube. https://www.youtube.com/watch?v=2Qc6EByGRuY

San Diego Zoo. (2023, Feb 4). Stuart the fishing cat [Video]. YouTube. https://www.youtube.com/watch?v=Ej__NdAglag

SAN DIEGO ZOO STORIES

Curtis, M. (2023, Jan 18). The Nose Knows: Helping Save Local Endangered Species. San Diego Zoo Wildlife Alliance. https://stories.sandiegozoo.org/2023/01/18/the-nose-knows-canine-companions-that-help-save-the-endangered-mountain-yellow-legged-frog/

Public Relations. (2020, Jan 21). Koala sniffer dog helps researchers find koalas after fires. San Deigo Zoo Wildlife Alliance. https://stories.sandiegozoo.org/2020/01/21/koala-sniffer-dog-helps-researchers-find-koalas-after-fires/

DESIGN CHALLENGE

San Diego Zoo. (2023). Homepage. San Diego Zoo Wildlife Explorers. https://sdzwildlifeexplorers.org/

San Diego Zoo. (2008, Nov 5). Bio-inspiration: Nature as muse [Video]. YouTube. https://youtu.be/JnBkbaFsZOY

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