

## From the Tip of a Beak to the End of a Tail

By Christine Anne Royce

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Two examples of animals assisted by humans can introduce students to the idea that different organisms have particular structures and adaptations that help the animal survive. When discussing the idea of structure and function with young children, it is important to help students make connections to the fact that “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” (NRC 2012, p. 144). The story of Winter the dolphin allows young students to consider how different animals use body parts to help them move and how each structure is best suited to that particular animal and its environment.

As students get older, the learning progression moves to the fact that these structures can be both internal and external, and may “serve various functions in growth, survival, behavior, and reproduction” (NRC 2012, p. 144). One such situation is presented in *Beauty and the Beak*, a book about a bald eagle named Beauty. By engaging in a simulation related to the structure of beaks, students draw connections between the shape of a bird’s beak and the type of food it eats.

### This Month’s Trade Books



*Winter's Tail: How One Little Dolphin Learned to Swim Again*  
By Juliana Hatkoff, Isabella Hatkoff, Craig Hatkoff, and David Yates  
ISBN: 978-0-545-34830-0  
Scholastic  
40 pages  
Grades K–3

### SYNOPSIS

Winter, a dolphin, was rescued as a baby from a crab trap that injured her tail. After being rescued, she received a prosthetic tail that helps her thrive in her home at the Clearwater Marine Aquarium. She now serves as an animal ambassador to children and adults alike.



*Beauty and the Beak: How Science, Technology, and a 3D Printed Beak Rescued a Bald Eagle*  
By Deborah Lee Rose and Jane Veltkamp  
ISBN: 13-978-1943978-28-1  
Persnickety Press  
40 pages  
Grades 2–5

### SYNOPSIS

Beauty is a bald eagle who lost her beak in a poaching accident. At a wildlife rescue, she was fitted with a 3D–printed beak that allowed her to feed and groom herself again. ●

### REFERENCE

National Research Council (NRC). 2012. *A framework for K–12 science education: Practices, crosscutting concepts, and core ideas*. Washington, DC: National Academies Press.



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## Grades K-2: What Does That Body Part Help Me Do?

### PURPOSE

To describe, draw, and act out how different body parts (structure) help animals move (function) and how those movements help with survival.

### ENGAGE

Explain to students that they are going to hear a true story about a dolphin named Winter. This story is the basis for the motion picture *Dolphin Tale!*, in which Winter plays herself.

Read *Winter's Tail* in its entirety to the class. Then, ask students to describe the problem that Winter faced and how the biologists solved the problem. Return to the story to re-read the following pages and discuss key points:

- pp. 2–3: When Winter became caught in the ropes, what happened to her tail?
- pp. 4–7: What were some of the problems that the fisherman and the rescue team faced as they tried to rescue Winter?
- pp. 10–13: Although Winter started to improve and drink milk from a bottle, she lost her tail due to her injuries. What does a dolphin's tail help it do? Describe how a dolphin normally moves its tail to swim. How did Winter start to swim?
- pp. 16–19: Even though Winter was swimming side to side, the team knew it needed to help Winter swim like a dolphin, which meant building a tail. What were some of the things they needed to consider as they created her new tail?



### MATERIALS

- *Winter's Tail*
- How Animals Move student sheet
- selection of land animals, ocean animals, birds, and common household animals (pictures, stuffed animals or plastic models)
- video: Animals in Action (see Internet Resources)



Ask students to describe and then pretend to move in the two ways Winter would swim, depending on whether she was wearing her tail. Finally, to help students begin to consider other animals' body parts, share the video "Animals in Action" (see Internet Resources) with the class and ask students to do the dance moves along with the children in the video. After they watch the video, ask students to think about how different animals move and what helps them move that way.

### EXPLORE

Using the How Animals Move student sheet (see NSTA Connection), model for students how to think about the information they must record using drawings or basic words. Use a dolphin as an example since they have just learned about Winter. Ask students:

- What are different ways that the dolphin moves? For example, a dolphin can swim, jump out of the water, or roll over in the water. Animals often move in many different ways.
- Which body part helps the animal to move in that way? A dolphin uses its tail to swim forward, propel itself, or jump out of the water, whereas it uses its flippers to help it roll over.





- Why is this movement or body part important for the animal's survival? Swimming fast allows dolphins to escape predators or reach the surface so they can breathe.

Next, ask students to think about different animals. Students should choose two different creatures from pictures, plastic models, or plush versions of a variety of animals, and answer the questions about those animals on their student sheet. Having a variety of land animals, ocean animals, birds, and common household animals available will help students make connections. Then, ask students to find a classmate who chose one of the same animals and compare ideas.

### EXPLAIN

After making a list of the animals that students selected, bring the class together. Selecting one animal at a time, ask all students who had a common animal to come to the front of the room and share their ideas about how that animal uses different body parts to move. As they are sharing their ideas, use the following questions to probe their understanding:

- What word would you use to describe how the animal moves? Can you be descriptive?
- When the animal moves, is it in the air, on the land, or in the water? What body part helps the animal in that location?
- Does the animal move in any other ways? Does it use the same body part to help it do that?
- How is this movement similar to the way humans move? How is it different?

Allow students to ask questions or add their own ideas after a group presents an animal.

### ELABORATE

Replay the video and discuss how the children in the video came up with a movement that mimics that of an animal and how the words of the song help someone picture how the animal is moving and where the animal is. Place students in groups of three or four, and assign them a new animal or allow them to pick a new animal from a set of cards. They will present the animal to the class through charades, and other students will try to figure out what animal they are acting out.

In their groups, students should discuss the animal, how it moves, the body part that helps it move, and how that body part helps it survive. This discussion allows students



to connect their understanding of structure and function to their animal's survival. After discussing, students should draw a picture of their animal on the back of their student data sheet. They should label the body parts they are going to use in their charade and describe how that body part helps the animal move. They should be descriptive in the words they choose to help others figure out what animal they are pretending to be.

Finally, students need to decide on a motion that represents the animal. For example, if students choose a kangaroo, they would select legs and describe the motion as leaping forward. Their actual motion might be to crouch down like

a kangaroo, with their hands held in front of them, and leap forward. Allow the groups to present their animal and then discuss as a class the choices the students made to represent that animal.

## EVALUATE

Students have several opportunities throughout the activity to show their understanding of how body parts help animals move and how each movement can help their survival. They use connections to the text, as well as movement and discussion with peers, to discuss these ideas.

## Connecting to the *Next Generation Science Standards* (NGSS Lead States 2013)

### K-2: WHAT DOES THAT BODY PART HELP ME DO?

- The chart below makes one set of connections between the instruction outlined in this article and the *NGSS*. Other valid connections are likely; however, space restrictions prevent us from listing all possibilities.
- The materials, lessons, and activities outlined in the article are just one step toward reaching the performance expectation listed below.

#### Standard

#### 1-LS1 From Molecules to Organisms: Structures and Processes

[www.nextgenscience.org/pe/1-ls1-1-molecules-organisms-structures-and-processes](http://www.nextgenscience.org/pe/1-ls1-1-molecules-organisms-structures-and-processes)

#### Performance Expectation

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.

#### DIMENSIONS

#### CLASSROOM CONNECTIONS

#### Science and Engineering Practice

##### Engaging in Argument From Evidence

Students explain which body part helps animals move in a particular way and how that movement helps the animal survive.

#### 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.

Students describe how different body parts help animals move and how those movements are the same as or different from humans' movements.

Students develop a movement to represent an animal and how it moves, and act it out as a charade for the other students.

#### Crosscutting Concept

##### Structure and Function

Students describe, draw, and act out how different body parts (structure) help animals move (function) and how those movements help with survival.

## Grades 3–5: Beautiful Bird Beaks

### PURPOSE

To describe how the structure and shape of a bird's beak helps it gather the food type that it needs to survive.

### ENGAGE

Begin by sharing the video *Bald Eagle: Animals for Children* (see Internet Resources) with the class. As students watch the video, they should focus on how an eagle uses both its talons and beak for catching and eating food. Ask students:

- Describe how, when the bald eagle swoops down to catch a fish, it uses its *talons*, or claws.
- Describe the shape of a bald eagle's beak. How does the shape help it eat fish?

Next, share with students the cover of *Beauty and the Beak* and ask them to think about the subtitle of the book: "How Science, Technology, and a 3D-Printed Beak Rescued a Bald Eagle." Before reading the book, ask students to think about what would happen to a bald eagle's ability to eat if something were wrong with its beak. (*Note to teacher:* This book does introduce in an age-appropriate manner the fact that Beauty had been shot. The teacher may want to address this point before diving into the story.) Share the story with



### MATERIALS

- *Beauty and the Beak*

#### For each group:

- aluminum pans
- small dishes
- teaspoon
- a serving spoon
- tweezers
- clothespins or pliers
- chopsticks
- straws
- bird "food" (goldfish crackers or gummy fish [actual fish], red shoestring licorice cut into 4-inch lengths [worms], sunflower seeds or unshelled peanuts [seeds], colored water [nectar], mini chocolate chips or rice [ants, small insects], mini marshmallows [caterpillars, maggots])
- My Beak student sheet
- Beak Explanation sheet
- picture of bald eagle
- videos: Bird Beak Gallery, Bird Food, Bald Eagle: Animals for Children (see Internet Resources)

students through the part where Beauty drinks water on her own following the surgery, stopping along the way to discuss the following points:

- p. 4: When the eaglet was still very small, how did she get food from her parents? How did she get food after she was about a month old?
- p. 5: What else did the young eagle use her beak for on a daily basis?
- p. 8: How did the bald eagle use her talons to catch fish?
- pp. 10–11: Describe how the bald eagle used her beak to eat the fish she caught. Why do you think the hooked shape of the beak helps her eat?
- p. 13: What were some of the problems the eagle faced when a bullet shattered her beak?
- p. 15: Look at the picture of Beauty and consider how a bald eagle eats. Describe why she needed human help to eat or drink.

- pp. 16–19: What was the solution that Janie and Nate came up with to help Beauty? What material was used to make the 3-D printed beak?
- pp. 20–23: What were some of the adjustments that needed to be made to the beak? Why was it important to have the beak “fit” properly on Beauty?
- p. 26: Why was it a good sign that Beauty could take a drink of water by herself with her new beak?

After reading the story to students, ask them to describe why it was important to help Beauty by building a prosthetic beak. Then, ask them how the shape of an eagle’s beak helps it survive in its environment.

## EXPLORE

Ask students to write a predictive statement on their My Beak sheet (see NSTA Connection) that answers the prompt, “Why is the shape of the beak important to a bird?”

Provide each group of students with the following assortment of “food” representing types of food a bird might eat: goldfish crackers or gummy fish (actual fish), red shoestring licorice cut into 4-inch lengths (worms), sunflower seeds or unshelled peanuts (seeds), colored water (nectar), mini chocolate chips or rice (ants, small insects), and mini marshmallows (caterpillars, maggots). (*Safety note:* Remind students that they should not put anything into their mouths during a science lesson. Before giving out the food, check for any student

## Connecting to the Next Generation Science Standards (NGSS Lead States 2013)

### 3-5: BEAUTIFUL BIRD BEAKS

- The chart below makes one set of connections between the instruction outlined in this article and the NGSS. Other valid connections are likely; however, space restrictions prevent us from listing all possibilities.
- The materials, lessons, and activities outlined in the article are just one step toward reaching the performance expectation listed below.

#### Standard

#### 4-LS1 From Molecules to Organisms: Structures and Processes

[www.nextgenscience.org/dci-arrangement/4-ls1-molecules-organisms-structures-and-processes](http://www.nextgenscience.org/dci-arrangement/4-ls1-molecules-organisms-structures-and-processes)

#### Performance Expectation

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

#### DIMENSIONS

#### CLASSROOM CONNECTIONS

#### Science and Engineering Practice

##### Engaging in Argument From Evidence

Students using evidence from the simulation, come to a group consensus on the best beak shape for picking up each type of food.

#### Disciplinary Core Idea

##### LS1.A: Structure and Function

Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

Students describe how the structure and shape of a bird’s beak helps it gather the food type that it needs to survive.

#### Crosscutting Concept

##### Structure and Function

Students engage in a simulation to examine how beak shape (structure) affects the type of food a bird can pick up (function).



allergies.) Using drawings and words on their sheet, students should predict the type of beak shape that might best pick up each type of food.

Once students have completed their predictions, tell them they will pretend to be birds and will be provided with different types of beaks to use. Their challenge is to determine which beak is best suited for picking up a certain type of food and how the shape of the beak helps. Unveil the beaks that will be used, which should include a teaspoon, a serving spoon, tweezers, clothespins or pliers, chopsticks, and straws. Before students try each type of beak, ask them to make predictions about which beak might be best suited for picking up each type of food by completing the appropriate section on their My Beak sheet.

Mix the food types and place them in a tray in the center of the table. Have each student pick a single beak type to start with, and tell students that they must use their chosen beak to pick up as much food as they can in 20 seconds. They can try to pick up any type of food they want, but it is important for them to realize that their survival depends on their ability to gather food. Students should manipulate their beak with only one hand and place their collected food in a small dish in front of them. After 20 seconds, students record which type of food was easiest to pick up and how much of each type of food was collected. Then, have students rotate their beak type, and repeat the process until each student has tried each beak type.

Although students often try to stab at the food with the straw, the teacher can demonstrate that some beaks are similar to straws and can fit into narrow food sources. Using a test tube filled with colored water, the teacher can show students that, if they put the straw inside and then put their finger over the opening of the straw, they can lift out some of the liquid.

## EXPLAIN

Ask student groups to use evidence from the activity to come to a consensus on which beak is best for picking up each type of food. Reasons may center around the amount of food collected or how the shape helped when picking up a certain type of food.

Bring the class back together and, discussing the beaks one at a time, ask students to provide the group answer and reasoning as to which food each beak was best able to pick up. Discuss the shape of each beak type and ask students to comment on the following:

- What did you observe as you tried to use the different beak shapes?
- Was a particular beak type better suited to picking up a certain type of food? If so, what shape was the beak and what kind of food was it?
- Can you think of real birds with beaks shaped like each

of our model beaks? What real food types are similar to our model food types?

- Describe a bird you have seen eating and what shape its beak was.

## ELABORATE

Using the pictures found in the slideshow “Bird Food” (see Internet Resources), show students the eight pictures of birds or print sets of the pictures for student groups. Using the Beak Explanation sheet (see NSTA Connection), students should examine each picture and identify the type of food the bird is eating, which classroom “bird food” is most similar and why, and how the shape of the bird’s beak helps it eat the food pictured.

Now share with students the second slide show from Bird Beak Gallery (see Internet Resources) and ask them to make a prediction about the type of food each bird would eat. They should record their answers on their Beak Explanation sheet. Then, students should use various media and the internet to determine what each bird eats to find out whether their prediction is correct. The Cornell Lab of Ornithology’s website (see Internet Resources) is a good source of information.

## EVALUATE

Throughout the investigations, students examine how the structure of a bird’s beak helps it gather food and survive. They engage in an initial discussion about Beauty’s beak. Then, they investigate different beaks and observe how beak shape helps birds gather certain types of foods. Finally, students make predictions and then revisit those predictions after an investigation or additional research.

## REFERENCES

- National Governors Association Center for Best Practices and Council of Chief State School Officers (NGAC and CCSSO). 2010. *Common core state standards*. Washington, DC: NGAC and CCSSO.
- NGSS Lead States. 2013. *Next Generation Science Standards: For states, by states*. Washington, DC: National Academies Press. [www.nextgenscience.org/next-generation-science-standards](http://www.nextgenscience.org/next-generation-science-standards).

## INTERNET RESOURCES

- Animals in Action Video and Song  
[www.youtube.com/watch?v=DYPTJj6hd44](http://www.youtube.com/watch?v=DYPTJj6hd44)
- Bald Eagle: Animals for Children  
[www.youtube.com/watch?v=oKficmlxzal](http://www.youtube.com/watch?v=oKficmlxzal)
- Bird Beak Gallery  
[https://wtf.pbslearningmedia.org/asset/tdc02\\_img\\_beakgallery](https://wtf.pbslearningmedia.org/asset/tdc02_img_beakgallery)
- Bird Food (PBS Learning Media)  
<https://wtf.pbslearningmedia.org/asset/tdc02-int-birdfood>

## Connecting to the *Common Core State Standards* (NGAC and CSSO 2010)

This section provides the *Common Core for English Language Arts and/or Mathematics* standards addressed in this column to allow for cross-curricular planning and integration. The Standards state that students should be able to do the following at grade level.

### ENGLISH/LANGUAGE ARTS

#### Reading Standards for Informational Texts K-5 – Key Ideas and Details

- Grade 1: “Ask and answer questions about key details in a text.”
- Grade 4: “Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.”

### LANGUAGE STANDARDS

#### Writing Standards K-5 – Research to Build and Present Knowledge

- Grade K: “With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.”
- Grade 3: “Conduct short research projects that build knowledge about a topic.”

#### Writing Standards K-5 – Text Types and Purposes

- Grade K: “Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.”
- Grade 2: “Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.”

#### Speaking and Listening Standards K-5 – Comprehension and Collaboration

- Grade 1: “Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.”

#### Speaking and Listening Standards K-5 – Presentation of Knowledge and Ideas

- Grade K: “Add drawings or other visual displays to descriptions as desired to provide additional details.”
- Grade 1: “Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.”

Vocabulary Acquisition and Use is one of the standards for language. This particular standard is across grade levels: “Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade [appropriate] reading and content.” Furthermore, the *Common Core for ELA* provide a standard related to the Range of Text Types for K-5 where it indicates that students in K-5 should apply the Reading standards to a wide range of texts to include informational science books.

Cornell Lab of Ornithology  
[www.birdsleuth.org](http://www.birdsleuth.org)

### TEACHING THROUGH TRADE BOOKS CONNECTIONS

Royce, C.A. 2017. Adaptations for survival. *Science and Children* 54 (7): 22-28.

Royce, C.A. 2016. The purpose of individual parts and processes. *Science and Children* 53 (9): 14-19.

Royce, C.A. 2017. Teaming up: Trade books and technology. *Science and Children* 54 (5): 22-28.

Royce, C.A. 2017. The tool and eye. *Science and Children* 55 (1): 22-27.

### NSTA Connection

Download student handouts at [www.nsta.org/SC1811](http://www.nsta.org/SC1811).