

# Feather Exploration

Science and Engineering Practices (SEP) – Asking questions & defining problems

Disciplinary Core Ideas (DCI) – From Molecules to Organisms: Structures and Processes

Use the boxes as guidelines to arrive at the NGSS standards which are written in **bold**

**Objective:** Students will learn about the structure and function of a feather through detailed observational drawing.

**Background:** Diversity of species is essential for every community to balance resources and successfully flourish. The unique form and function of each living thing is key to this balance. The thing that makes all birds unique is the ability to grow **feathers**, and the form and function of a bird's feather is an amazing phenomenon to explore! Birds have different kinds of feathers that serve different functions – stiff **contour** feathers help to keep their wings strong in flight, and fluffy **down** feathers help to insulate their bodies.

## Activity:

Ask students to provide an explanation as to how birds can fly. Have them draw diagrams to support their explanation. See if students can explain similarities between birds and other flying objects – like an airplane or a hang glider.



- 1) Pass out **feather, toothpick** and **magnifier** to each student. Allow students to access **spray bottle** if desired
- 2) Have students explore the structure of their feathers and draw details of the feather using magnifiers

## Ask questions that can be investigated

- What details or features of the feather do you notice?*
- How many different parts of the feather are there? Describe them.*
- How do the strands connect?*
- What happens to the feathers when you separate the strands?*
- Are both sides of the feather the same?*

## Predict reasonable outcomes based on patterns such as cause and effect relationships.

- Do you think all feathers work for flight? Why or why not?*
- Which features could lead to flight?*
- Compare your feather with a neighbor's. How do their structures differ?*

## Ask about what would happen if a variable is changed

- What happens to the feather when it gets wet?*
- How does it stay smooth?*
- Flap or drop your feather, what happens?*

## Identify scientific (testable) and non-scientific (non-testable) questions

Have students make a T-chart of **scientific** and **non-scientific** questions about feather structure and function on the front board.

- 3) Have students discuss in pairs how they would test their scientific questions. Then, have them share with the class. *Write students' questions on the front board, as we will circle back to answer the questions at the end of the lesson.*

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

*What other purposes can feathers serve besides flight?*

*Do different feathers serve different purposes?*

Have students consider how a bird's feathers contribute to its survival. Think about: flight, finding a mate, defense, protection, etc.

- 4) Present to the class diagrams and information on the form and function of feathers
- 5) Allow time for students to return to their feather exploration, adding more details and written explanations
- 6) Have students do a gallery walk around the class to see all of the different feathers
- 7) Finally, return to the questions on the front board as a class to come up with possible answers for them

**Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.**

Go outside and look for examples of feather structure on your schoolyard, or inside of your classroom.

*What does the structure of the feather remind you of?*

The barbule structure of the feather inspired the innovation of Velcro and Zippers. Encourage students to apply what they know about the way a feather works to come up with their own innovations.

*How could the structure of a feather be used to improve windmill blades?*

*What about airplanes, cars or other methods of transportation?*

**Assessment question:** Have students submit their answers in order to assess their understanding

**An adaptation is a special skill or feature of an organism that makes it fit for its environment or for its particular way of life.**

*Feathers are unique to birds. Draw or describe a special feature that you can think of that is unique to another animal and explain how that feature might help it survive.*



**Schoolyard connection activity:** Have students further explore their bird knowledge by researching unique birds and their adaptations to particular environments. Plan a bird walk around the schoolyard to see if you can create a bird guide for your school!

## **Feather Exploration kit materials:**

**30 + feather samples**

**30 + hand lenses**

**Toothpicks**

**Spray bottles**

**2 large magnifiers**

**9 Feather diagrams**

### ***Additional resources:***

**Schoolyard birds of San Jose**

**"The Wonder of Bird Feathers"**

**"What Makes a Bird a Bird"**

**2 Bay Area local bird guides**

**Fandex bird field guide**

**"Raptor!"**

**"Friends of a Feather"**

**"Eyewitness Books: Bird"**