unit 5

Birds, Beaks and Babies
What do you need to know to build a bird nest?

Why do birds need nests? What is a life cycle?

What is the connection between what we have and what we do?

How can we communicate what we have learned about birds?

What is a nest? How are baby animals like, but not exactly like, their parents?

How do organisms grow and develop?

How do patterns in the behavior of parents and offspring help them survive?

How can we make a nest that holds eggs?
# Unit 5 Teacher Preparation List

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Inside MySci kit, you’ll find:</th>
<th>Items you must supply:</th>
<th>Extra prep time needed:</th>
</tr>
</thead>
</table>
| Lesson 1 | Bag of nesting material  
Poster with pictures of bird nests | Gathered natural materials (e.g., sticks, leaves, twigs, pine cone needles, grass, moss, etc.)  
Books from library about birds  
Chart paper  
Science notebooks  
Homework: Ask the students to bring in baby pictures. They will use the pictures in an upcoming activity. | Review MySci Safety Guidelines  
Copy and administer pre-assessment  
Copies of Engineering Design Cycle (Appendix i)  
Copies of KWL chart (Appendix ii)  
Copies of Nest Design sheet (Appendix iii) |
| Lesson 2 | Animal Life Cycle Video  
1 set of Animal Parent and Baby Match Cards  
1 poster of Animals and Their Babies | Science notebooks  
Chart paper  
Homework: Ask the students to bring in baby pictures. They will use the pictures in an upcoming activity. | Copies of Venn Diagram activity sheet (Appendix iv) |
| Lesson 3 | Animal life cycle cards  
*From Tadpole to Frog*, by Wendy Pfeffer | Pictures of the students when they were babies  
Internet access | Copies of Then and Now activity sheet (Appendix v)  
Copies of the Draw and Compare activity sheet (Appendix vi) |
| Lesson 4 | Cornell lab cards  
*Birds* models  
*How Do Birds Find Their Way*, by Roma Gans  
6 Stations for the Bird Beak Buffet:  
**Station 1**  
4 paper plates, 4 “Logs”, 4 tweezers, Small bag of rice  
**Station 2**  
Box of soil and plastic worms, 4 tongs  
**Station 3**  
4 pliers, bag of sunflower seeds  
**Station 4**  
Container and plastic fish, 4 fishnets  
**Station 5**  
tall cylinder, 4 pipettes  
**Station 6**  
4 dowels with clay attached, 4 scissors | Paper for drawing  
Internet access | Copies of Bird Cam Observation Sheet (Appendix vii)  
Copies of KWL Chart from Lesson 2 (Appendix ii) |
| Lesson 5 | Cornell lab cards  
*Birds* models  
*How Do Birds Find Their Way*, by Roma Gans  
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**Station 5**  
tall cylinder, 4 pipettes  
**Station 6**  
4 dowels with clay attached, 4 scissors | Science notebooks | Copies of Bird Beaks Chart (Appendix viii)  
Copies of Bird Adaptations (Appendix ix)  
Copies of Bird Beak Buffet data sheet (Appendix x) |
| Lesson 6 | *Birds, Nests, and Eggs*, by Mel Boring  
Bag of nesting materials from Lesson 1  
Bird nest poster from Lesson 1  
18 little white eggs | Gathered natural materials (e.g., sticks, leaves, twigs, pine cone needles, grass, moss, etc.)  
Internet access | Copies of Engineering Design Cycle (Appendix i)  
Copy and administer post-assessment |
What do you need to know to build a bird nest?

Lesson 1: What is a nest?

Learning Target
Describe how birds build nests.
Design a bird nest using the Engineering Design Cycle.

Summary
Students will be introduced to the challenge of creating a bird's nest out of natural materials and begin to discuss physical structures of birds.

Engage
Ask the class: Has anyone seen a bird’s nest before? Where was it? What did it look like? Do you think it was hard to build? Show Barn Swallow Nest Building Project: https://www.youtube.com/watch?v=hmFkYh8DeEY

Birds are one of Nature’s best engineers. Ask students: Do you know why?
Pass out the copies of the Engineering Design Cycle (Appendix i). Go over each step and relate it to how a bird builds a nest:

- Identify the need or problem — need a home for their babies
- Research and brainstorm — look at other nests, follow their instinct
- Choose the best ideas — using what they can find, they gather materials
- Construct a prototype — they try to build a nest
- Test and evaluate — they see if the nest will hold their eggs, or be safe from predators
- Communicate — if successful, they pass their nest building ability to their babies
- Redesign — if not, they have to try and build another nest

Explore
Do you think it is hard to build a nest? Let’s try! With a partner try and build a little nest. Talk about how you are going to do it with your partner and draw a picture of how you want it to look. When you are done with the picture, show it to me and I will give you materials to try and build it.

Explain
Ask the students: What questions did I ask as I make my nest? Teachers will listen and record anecdotal notes about what students are asking, what they are saying, and how they are applying their prior knowledge to their exploration of nest building.

MySci Materials:
Bag of nesting material
Poster with pictures of bird nests

Teacher Provides:
Copies of Engineering Design Cycle (Appendix i)
Copies of KWL chart (Appendix ii)
Copies of Nest Design sheet (Appendix iii)
Gathered natural materials (e.g., sticks, leaves, twigs, pine cone needles, grass, moss, etc.)
Books from library about birds
Chart paper
Science notebooks

Homework:
Ask the students to bring in baby pictures. They will use the pictures in an upcoming activity.

Teaching Tip:
This icon highlights an opportunity to check for understanding through a formal or informal assessment.

Teaching Tip:
This process will be revisited in Lesson 6 when students are asked to brainstorm ideas about nest structures, using what they have learned in the unit.
Lesson 1 continued: What is a nest?

This is the basis of inquiry as students will do trial and error, playing with the materials. The data that the teacher collects will be useful throughout the rest of the unit.

ELABORATE
Ask the class: Do all birds build the same kind of nests? Bring out the bird poster and have the students discuss the differences among the nests.

EVALUATE
Ask the class: What questions do I have about birds and their nests?

Although the teacher collected anecdotal data from students as they explored and created with the natural materials, it is important before the next five lessons unfold for students to go back to their KWL chart (Appendix ii) to see if any of their questions were answered and to discover what other questions they now have after their hands-on creations. Finally, students reflect on their learning by completing their Nest Design sheet (Appendix iii).

Teaching Tip:
Some question about nest building might be: Do all birds build the same kind of nests?
Lesson 2: How are baby animals like, but not exactly like, their parents?

LEARNING TARGET
Differentiate between parent and offspring.

SUMMARY
Students will be able to compare baby animals with their parents and other types of baby animals through identifying similarities and differences between the parent and the baby, and learn the names of different animal offspring.

ENGAGE
Ask the class: Why do birds make nests? (To provide shelter for their young.) Why can’t they take care of themselves? (They are too little and not developed fully). How are animals alike and different from their parents? Show the poster of the animals and their babies.

Ask the students for examples of how things grow and change. Write them on a chart paper. Then watch Animal Life Cycle Video. Ask the students how each of the animals grew and changed.

EXPLORE
Ask the class: What do you already know about babies? Pass out one Animal Parent or Baby card to each student. Have them try to find their match. The directions for this game also include the students acting like their animals to find their parents.

EXPLAIN
Ask the class: How are the parent animals different from the babies? How did you know which ones went together? What three ways are you different now than you were when you were a baby? Students will write down their answers in their science notebooks. Questions to guide thinking:

- How are babies different from their parents?
- What kinds of things do babies eat/drink differently?

MYSCI MATERIALS:
- Animal Life Cycle Video
- 1 set of Animal Parent and Baby Match Cards
- 1 poster of Animals and Their Babies

TEACHER PROVIDES:
- Copies of Venn Diagram activity sheet (Appendix iv)
- Science notebooks
- Chart paper

Homework:
Ask the students to bring in baby pictures. They will use the pictures in an upcoming activity.

Teaching Tip:
Students with cards of animals that go through metamorphose might have a hard time finding their mates. That experience will provide good questions for the Elaboration part coming up.
Lesson 2 continued: How are baby animals like, but not exactly like, their parents?

ELABORATE
Ask the class: Is it possible that not all living things look like their parents?
Remind the students about the Life Cycle video and the frog and butterfly. Why don't those baby animals look like their parents? Ask the students who had trouble finding their matches. Have them explain how different the babies looked from their parents.

EVALUATE
Ask the class: How can we communicate what we know about the similarities and differences we are seeing and talking about?
Have students pick from the Animal Matching cards one set of parent/baby cards. Have them use that animal to complete the Venn Diagram sheet (Appendix iv).

Teaching Tip:
Have a number of different parent and baby books from library/book room available to students to use during the evaluating question with the Venn Diagram. Make sure you have taught the Venn Diagram format and how it is used prior to this use.
Students could choose a new animal or do the one from the book they read in team activity.
Lesson 3: How do organisms grow and develop?

LEARNING TARGETS
Describe various organism life cycles.
Compare and contrast the life cycles of different organisms.

SUMMARY
Students will participate in instructional conversations with the teacher and other students regarding animal parents and babies and the life cycle of frogs, birds, and butterflies. Students will watch videos, play life cycle games on the smart board, and will be able to identify the life cycle stages of a frog.

ENGAGE
Ask the class: How do organisms change as they go through their life cycle?
Students will work on teams to make drawings showing what they already know about animal life cycles and then ask questions they might have and what they want to learn about life cycles.

EXPLORE
Teacher will discuss questions and drawings and then read From Tadpole to Frog. Instruct students to watch the Frog Life Cycle Video http://www.teacher-tube.com/viewVideo.php?video_id=294327 which includes general information about life cycles of frogs.

- Where did the frog come from or what did it start out as?
- What was the frog before it turned into a frog?
- What was the first thing the tadpole grew?
- What happened to the tadpole’s tail?
- What does the frog look like when it is grown?

Frog Life Cycle Play — Students will act out the stages of the frog life cycle:
1. Students huddle together like eggs on the water.
2. Whole group begins to separate as eggs hatch.
3. Each student moves about with feet together and hands at their sides.
4. Students show how legs start to grow — students shake both legs and

MYSCI MATERIALS:
Animal life cycle cards
From Tadpole to Frog, by Wendy Pfeffer

TEACHER PROVIDES:
Copies of Then and Now activity sheet (Appendix v)
Copies of the Draw and Compare activity sheet (Appendix vi)
Pictures of the students when they were babies
Internet access

RECOMMENDED TRADE BOOKS:
A Nest Full of Eggs, by Priscilla Betz Jenkins
Birds’ Nest, by Barrie Watts
Two Frogs in Trouble, by Paramahansa Yogananda
Lesson 3 continued: How do organisms grow and develop?

begin moving with legs apart, hands still at their sides.
5. Students show how front legs appear by wiggling arms from elbow down.
6. Students show big eyes bulging out and gather at edge of group (edge of pond).
7. The little froglets hop out of the pond.

EXPLAIN
Ask the class: Do different animals have different stages in their life cycles?
Students will work in teams with the Life Cycle cards and put them in order. Each team will show and discuss an animal life cycle for the class. Do all parents care for their young in the same way? Why or why not? (because different animals have different needs)

ELABORATE
Ask the class: What did we look like as babies? Have each child show his/her picture and tell what he/she was doing in the picture using the Then and Now activity sheet (Appendix v).

EVALUATE
☐ How is our life cycle different from a frog’s? Using the Draw and Compare sheet (Appendix vi), have students complete and discuss.

Teaching Tip:
Have life-cycle books from library/book room available to students to use during Lesson 3. The variety in the books will help them get the sense of life cycles and how they are similar and different. These books also will help them with the matching activity.
Lesson 4: How do patterns in the behavior of parents and offspring help them survive?

LEARNING TARGET
Describe the interactions between parent birds and baby birds.

SUMMARY
Continuing from Lesson 3, students will learn about bird life cycles and the patterns of behavior between parent birds and offspring during nesting and fledging of the babies. Students will use the “Nest Cam” experience on the Internet/smart board to observe and collect data in journals over time about the hatching, feeding, growing, and fledging of bird offspring.

Tied to camera placement and use, this lesson incorporates engineering in understanding the nest boxes and the “point of view” of the birds.

Students will collect and record data as they are watching the Nest Cams for future use, using the Bird Cam Observation Sheet (Appendix vii).

ENGAGE
Ask the students: What do your parents do to take care of you? (feed you, take care of you, love you). What is a bird? What do they do to take care of their young?

Students will look at the KWL charts they made in Lesson 1 (Appendix ii), review what they learned about life cycles, and start a new column on the KWL for comparing the parental care of birds and humans.

Tell students: We are going to record what we see on our Observations sheets (Appendix vii). Review the sheet with the students and use for the first observation.

EXPLORE
Watch Life Cycles: A Bird Story http://www.youtube.com/watch?v=dyZjCw5R-l2Y. Discuss video. Ask the class: How do bird parents take care of their babies through the life cycle of birth and growth?

Teacher will activate a nest cam on smart board using one of the websites under Teaching Tip.

- If it is the season for live nest-cam viewing, teacher will pick a nest that can be viewed each day over a two-week period.
- Teacher also can show an archived nest-cam video that will show the highlights during a shorter time span. American Eagle Foundation http://www.eagles.org/programs/aef-nest-cam/Archived-Nest-Cam-2011.php has a great video of an eagle feeding its young.
- Teacher will pick at least two different nest cams so students can compare the way different bird parents interact with their offspring.

Engineering Connection: This is an opportunity to remind students that the perspective of the cameras used in the nesting cams is similar to the way engineers look at things.

TEACHER PROVIDES:
Copies of Bird Cam Observation Sheet (Appendix vii)
Copies of KWL Chart from Lesson 2 (Appendix ii)
Paper for drawing
Internet access

RECOMMENDED TRADE BOOKS:
The Life Cycle of a Bird, A Bobbie Kalman Book
Where is Home, Little Pip? by Karma Wilson & Jane Chapman
Backyard Birds, by Robert Bateman
The Barn Owl, by Tony Johnston
Owls, by Gail Gibbons
Birds, Nests, and Eggs, by Mel Boring
Feathers for Lunch, by Lois Ehlert

Teaching Tip:
Teachers should compile as many resources with general bird information as possible. They will be great tools for students as they explore, question, and research one bird. Extra books from library/reading room, magazines such as Missouri Conservationist, color pictures of birds on card stock, and bird guides that contain specific information about each bird all will be helpful.

Teaching Tip:
Teacher should view bird nest cams prior to classroom viewing to find ones that are active and appropriate for students:

All About Birds
http://cams.allaboutbirds.org
View Nesting Birds
http://www.viewbirds.com
San Diego Zoo Condor Cam
http://endextinction.org/condor-cam
Red-tailed Hawks
http://cams.allaboutbirds.org/channel/16/Red-tailed_Hawks/
**Lesson 4 continued:** How do patterns in the behavior of parents and offspring help them survive?

A priority in this lesson is for students to view “live” nests with parents and offspring interacting. Students will be observing, recording, and talking about how the parents and their offspring interact.

**EXPLAIN**

Ask the class: *How can we observe and record what we are learning about the bird life cycle as we watch baby birds in the nest and parent care-giving?*

Pass out copies of the Bird Cam Observation Sheet (Appendix vii) and teacher will model how to fill it out.

Students will view the nest each day at the same time, if possible, to collect data about what the parents and offspring are doing in the nest and record their findings in their journals.

**ELABORATE**

Ask the class: *Do different kinds of birds have different life cycles, different nests, and different parent care?* Teacher will show at least two nest cams with different species so students can observe and note differences in how the parents and offspring act.

**EVALUATE**

Ask the class: *What have you learned about parent birds and their offspring from watching them live in their nests?*

Ask: *Can you write a story about the bird family you have been watching? Be sure to include things like the type of bird, size, color, number of eggs or babies, and other interesting facts.*

**Journaling Tip:**

Students will use their journals and a specific format given by the teacher in the introduction to nest-cam observations to record daily activity over a two-week period as students observe nests live on the smart board.

Students will record final observations after teacher has charted whole group findings.
Lesson 5: How are birds adapted to help them survive?

LEARNING TARGETS
Identify and describe examples of bird adaptations.

SUMMARY
Students will participate in “Bird Beak Buffet,” a centers activity, to explore how birds have adapted to different environments and different foods.

ENGAGE
Ask the class: What kind of foods do you like to eat?
Teacher will start out by asking students what kind of foods they like to eat. Follow-up questions:

- What do you use to eat these foods?
- Why do you think we eat some foods with a spoon, some with a fork, and some with our fingers?
- What do birds use to eat?
- Why did certain utensils work well with certain foods?
- Do birds use utensils to eat?
- How do birds eat?

Teacher can draw a bird on board/smart board without a beak and talk to students about what is missing and ask students to draw a beak. Are all bird beaks the same?
Pass out the Bird Beaks Chart (Appendix viii) and have the students color them.

EXPLORE
Ask the class: How can we explore beaks and how birds use them to get their food?
Teacher will set up bird-beak stations and students will explore each station, figuring out how to pick up the food items with the utensil at each station. Pass out the Bird Beak Buffet Data Sheet (Appendix x) and explain how to fill it out as they go to each station. They do not fill in the last row of boxes yet!

EXPLAIN
Ask the class: What did we learn about beaks and how they are adapted for bird survival?

MYSCI MATERIALS:
Cornell lab cards
Bird models
How Do Birds Find Their Way, by Roma Gans
6 Stations for the Bird Beak Buffet:

Station 1
4 paper plates
4 “Logs”
4 tweezers
Small bag of rice

Station 2
Box of soil and plastic worms
4 tongs

Station 3
4 pliers
Bag of sunflower seeds

Station 4
Container and plastic fish
4 fishnets

Station 5
tall cylinder
4 pipettes

Station 6
4 dowels with clay attached
4 scissors

TEACHER PROVIDES:
Copies of Bird Beaks Chart (Appendix viii)
Copies of Bird Adaptations (Appendix ix)
Copies of Bird Beak Buffet Data Sheet (Appendix x)
Science notebooks

RECOMMENDED TRADE BOOKS:
Fine Feathered Friends, by Jane Yolen
(Poems: “Pelican Meals” & “Wood Peck”)

Beaks! by Sneed B., III Collard and Robin Brickman

How and Why Birds Use Their Bills, by Elaine Pascoe
Lesson 5 continued: How are parents and offspring adapted to help them survive?

Teacher will pick up one of the bird “beaks” and ask students which “food” they found was easiest to eat with that beak. Which was the hardest? Teacher will talk about the real birds with this kind of beak.

Repeat the discussion for each of the “beaks.” Have the students draw and label one of the beaks in their science notebooks.

ELABORATE
Give each student a Cornell Lab card of a bird. Have the students examine each card, looking carefully at the beaks. Then ask the students to compare their card with a neighbor and discuss the beak difference.

With the whole group, go back to the Bird Beak Buffet Data Sheet and ask the class if anyone has a card of a bird that goes with Station 1. Repeat with all the stations until the students are able to find a bird for each station. (You can also refer to the bird beak activity sheet, Appendix xi.

Then divide the class into 6 groups and pass out a bird model to each group. Have the students examine the bird. Pass out the Bird Adaptation Sheet, Appendix x. Have the group fill out the chart on their bird model and then exchange their model with another group until the chart is filled out. Discuss as a group.

EVALUATE
Ask: Why are bird beaks different? I want to show you some pictures of birds. (Show some of the pages in How Do Birds Find Their Way.) Then pass out some of the Cornell Lab cards. Ask the students to look carefully at the beaks in each picture. Ask them which station they think a particular bird would be able to eat best from. How can looking at a bird’s beak help us guess what it eats?

Students will answer the above questions in their science notebooks.

Teaching Tip:
Directions for setting up Bird Beak Buffet:
Station 1
Put 2 “logs” on a paper plate. (Use the other 2 paper plates for Station 3.) Fill the holes with grains of rice. Put the tweezers next to the logs.

Station 2
Open the container of soil and plastic worms. Make sure the worms are buried in the soil. Lay the tongs next to the container.

Station 3
Open the bag of sunflower seeds and pour some of them on the paper plate from Station 1. Put the pliers next to the plate. Remind the students not to eat the seeds.

Station 4
Fill the container half full with tap water. Add the fish. Put the fishnets next to the container.

Station 5
Fill the cylinder with water almost to the top. Set the pipettes next to the container.

Station 6
Lay the clay covered dowels on the last paper plate from Station 1. Put the scissors next to the dowels. (After each round you will need to put the clay back on the dowels if the students managed to cut off some of the clay with the scissors.

Teaching Tip:
Teacher can elaborate on the adaptation theme in this lesson by talking to students about other bird adaptations such as webbed feet for birds that spend time in water, grasping toes for birds that spend time roosting in trees, and sharp claws (talons) for birds that catch and kill prey. A bird’s feathers and color scheme help it fly, stay dry, attract a mate, and/or blend in with its surroundings.
Lesson 6: How can we make a nest that holds eggs?

LEARNING TARGETS
Collaboratively design a bird nest using the Engineering Design Cycle.

SUMMARY
Students will revisit the engineering challenge of creating a bird’s nest out of natural materials. In this lesson, students are presented with the design challenge to construct a nest out of natural materials that will hold three eggs.

ENGAGE
Ask the class: Remember when we started this unit and we tried to make bird nests? Well now that we have learned a few things about birds, let’s try again. But this time we are going to add a challenge. Your nest will have to hold 3 eggs I give your group!

Teacher will show short video about birds using things from nature to make their shelters/nests. Watch American Robin Bird Nest Build http://www.youtube.com/watch?v=tGPvf-M5h6k

Teacher will explain the project in which each student will make a nest for a bird. Talk to students about boundaries and guidelines they will follow to make their nests, such as only materials that are supplied (birds can only use materials they find in their environment), and that it must hold 3 eggs without falling apart.

EXPLORE
Ask the class: What could be some solutions? How do I brainstorm some ideas? How do I choose the best one?

Teacher will model brainstorming with the whole group and then set students to work either individually or in teams to design their nests by drawing pictures. To aid in the brainstorming of ideas, refer to the Bird nest poster. Consider having students get their designs approved by teacher.

EXPLAIN
Ask the class: How will I plan my project? What materials will I need? After check off, each student will draw a final design and make a list of materials.

ELABORATE
Ask the class: How will I create my nest? Students will create their nests. Nests will be shared with whole group and evaluated based on how well they work to shelter birds. Read the book Birds, Nests, and Eggs, by Mel Boring to learn more about the variety of birds and nest designs.
Lesson 6 continued: How can we make a nest that holds eggs?

EVALUATE

✔ Ask the class: *How can I improve my nest so it will work better?*

Students will be asked to improve on their nests if they are not functioning. Develop nest building design rubric to include components of what students need to address in their nest building.
### NEXT GENERATION SCIENCE STANDARDS

#### Key to Understanding the NGSS Codes

*NGSS codes begin with the grade level, then the “Disciplinary Core Idea code”, then a standard number. The Disciplinary Core Ideas are:*

**Physical Sciences**
- PS1: Matter and its interactions
- PS2: Motion and stability: Forces and interactions
- PS3: Energy
- PS4: Waves and their applications in technologies for information transfer

**Life Sciences**
- LS1: From molecules to organisms: Structures and processes
- LS2: Ecosystems: Interactions, energy, and dynamics
- LS3: Heredity: Inheritance and variation of traits
- LS4: Biological evolution: Unity and diversity

**Earth and Space Sciences**
- ESS1: Earth’s place in the universe
- ESS2: Earth’s systems
- ESS3: Earth and human activity

**Engineering, Technology, and Applications of Science**
- ETS1: Engineering design
- ETS2: Links among engineering, technology, science, and society

*For more information, visit [http://www.nextgenscience.org](http://www.nextgenscience.org)*

#### NGSS PERFORMANCE EXPECTATIONS

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Standard Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-ESS2-2</td>
<td></td>
<td>Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.</td>
</tr>
<tr>
<td>1-LS1-1</td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>1-LS1-2</td>
<td></td>
<td>Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.</td>
</tr>
<tr>
<td>1-LS3-1</td>
<td></td>
<td>Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.</td>
</tr>
<tr>
<td>K-2-ETS1-1</td>
<td></td>
<td>Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.</td>
</tr>
<tr>
<td>K-2-ETS1-2</td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>K-2-ETS1-3</td>
<td></td>
<td>Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.</td>
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</tbody>
</table>
### SCIENCE AND ENGINEERING PRACTICES

#### Asking Questions and Defining Problems
- Ask questions about what would happen if a variable is changed.
- Use prior knowledge to describe problems that can be solved.
- 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.

#### Developing and Using Models
- Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.
- Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.

#### Planning and Carrying Out Investigations
- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
- Make predictions about what would happen if a variable changes.
- Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.

#### Constructing Explanations and Designing Solutions
- Construct an explanation of observed relationships (e.g., the distribution of plants in the back yard).
- Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.
- Identify the evidence that supports particular points in an explanation.
- Apply scientific ideas to solve design problems.
- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.

### DISCIPLINARY CORE IDEAS

#### Structure, Function, and Information Processing
- **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 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)

### CROSSCUTTING CONCEPTS

#### Patterns
- Patterns of change can be used to make predictions.
- Patterns can be used as evidence to support an explanation.

#### Cause and Effect: Mechanism and Prediction
- Cause and effect relationships are routinely identified.

#### Systems and System Models
- A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.
- A system can be described in terms of its components and their interactions.

#### Structure and Function
- Different materials have different substructures, which can sometimes be observed.
- Substructures have shapes and parts that serve functions.

#### Stability and Change
- Change is measured in terms of differences over time and may occur at different rates.
- Some systems appear stable, but over long periods of time will eventually change.
Key to Understanding the GLE Codes

GLE codes are a mixture of numbers and letters, in this order: Strand, Big Idea, Concept, Grade Level and GLE Code.

The most important is the strand. The strands are:

1. ME: Properties and Principles of Matter and Energy
2. FM: Properties and Principles of Force and Motion
3. LO: Characteristics and Interactions of Living Organisms
4. EC: Changes in Ecosystems and Interactions of Organisms with their Environments
5. ES: Processes and Interactions of the Earth’s Systems (Geosphere, Atmosphere and Hydrosphere)
6. UN: Composition and Structure of the Universe and the Motion of the Objects Within It
7. IN: Scientific Inquiry
8. ST: Impact of Science, Technology and Human Activity

For more information, visit [http://dese.mo.gov/college-career-readiness/curriculum/science](http://dese.mo.gov/college-career-readiness/curriculum/science)

<table>
<thead>
<tr>
<th>Concepts</th>
<th>GLE Standards</th>
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</thead>
<tbody>
<tr>
<td><strong>First Grade</strong></td>
<td><strong>IN 1 C 1 b</strong></td>
</tr>
<tr>
<td>LO 1 A 1 a</td>
<td>Use observations to describe relationships and patterns and to make predictions to be tested</td>
</tr>
<tr>
<td>LO 1 D 1 b</td>
<td>IN 1 C 1 c</td>
</tr>
<tr>
<td>LO 1 D 1 d</td>
<td>Compare explanations with prior knowledge</td>
</tr>
<tr>
<td>LO 1 E 1 a</td>
<td>IN 1 D 1 a</td>
</tr>
<tr>
<td>IN 1 A 1 a</td>
<td>Communicate simple procedures and results of investigations and explanations through: oral presentations, drawings and maps, data tables, graphs (bar, pictograph), writings</td>
</tr>
<tr>
<td>IN 1 A 1 b</td>
<td>ST 1 A 1 a</td>
</tr>
<tr>
<td>IN 1 B 1 a</td>
<td>Describe how tools have helped scientists make better observations (e.g., magnifiers, balances, thermometers)</td>
</tr>
<tr>
<td>IN 1 B 1 a</td>
<td>ST 3 A 1 a</td>
</tr>
<tr>
<td>IN 1 B 1 b</td>
<td>Identify a question that was asked, or could be asked, or a problem that needed to be solved when given a brief scenario (fiction or nonfiction of individuals solving everyday problems or learning through discovery)</td>
</tr>
<tr>
<td>IN 1 B 1 d</td>
<td>ST 3 A 1 b</td>
</tr>
<tr>
<td>IN 1 C 1 a</td>
<td>Work with a group to solve a problem, giving due credit to the ideas and contributions of each group member</td>
</tr>
<tr>
<td>IN 1 C 1 a</td>
<td>Use observations as support for reasonable explanations</td>
</tr>
</tbody>
</table>
INSTITUTE FOR SCHOOL PARTNERSHIP
LEAD CURRICULUM TEAM
Skyler Wiseman, K-5 Curriculum and Instructional Specialist, Team Leader
Kimberly Weaver, Engineering Educator
Gennafer Barajas, Communications Coordinator
Victoria May, Executive Director of Institute for School Partnership, Assistant Dean of Arts and Sciences
Chris Cella, ISP Resource Center Fleet and Warehouse Coordinator
James Peltz, Warehouse Assistant
Paul Markovitz, PhD, Science Educator
Keith May, Operations and Materials Manager
Diane Pilla, ISP Resource Center Project Coordinator
Rachel Ruggirello, Curriculum and Assessment Specialist
Jeanne Norris, Teacher in Residence
Jack Weigers, PhD, Science Educator
EXTERNAL EVALUATOR
Katherine Beyer, PhD
COPY EDITOR
Robert Montgomery
LAYOUT DESIGN
Amy Auman
WUSTL CONSULTANTS
Rich Huerrermann, PhD, Administrative Officer, Department of Earth and Planetary Sciences
Harold Levin, PhD, Professor Emeritus, Department of Earth and Planetary Sciences

INDEPENDENT CONSULTANTS
Charlie McIntosh, Engineering
Carol Ross-Baumann, Earth Sciences

MISSOURI BOTANICAL GARDENS CONSULTANTS
Bob Coulter, Director, Litzsinger Road Ecology Center
Jennifer Hartley, Senior Supervisor of Pre K-8 School Programs
Sheila Voss, Vice President of Education

Teacher Authors, Field Testers and Contributors

BLESSED TERESA OF CALCUTTA
Kate Kopke
Sue Ritcher

CHESTERFIELD MONTESSORI
Ama Martinez

COLUMBIA PUBLIC SCHOOLS
Michael Cranford
Ben Fortel
Tracy Hager
Megan Kinkade
Anne Kome
Heather Lewis
Jessica Miller
Elizabeth O’Day
Mike Szyalowski
Jen Szyalowski
Matt Wightman
Rebecca Zubrick

FORSYTH SCHOOL
Gary Schimmelenig

THE COLLEGE SCHOOL
Uchenna Ogu

FERGUSON & FLORISSANT
Justin Brotherton
Eric Hadley
Christine Ries
Tonja Robinson
Laura Caldwell
Karen Doering
Emily Dolphus
Shaylne Harris
Amelia Hicks
Cathy Holway

FORSYTH
Gary Schimmelenig

HAZELWOOD
Kelli Becker
Sara Berghoff
Rita Bohlen
David Busch
Bill Caldwell
Georgene Collier
Arianna Cooper
Jennifer Forbes
Susan Gentry
Toni Grimes
Debra Haalboom

Stephanie Heckstetter
Lesli Henderson
Christina Hughes
Stephanie Knight
Scott Kratzer
Stephanie Latson
Jane McPartland
Lisa McPherson
Danice Murray
Dawn Proubst
Lisa Schuster
Twyla Vaslesy
Sonya Volk
Carol Welch
Cherronda Williams
Justin Woodruff

MIRIAM
Angie Lavin
Jenny Wand
Joe Zapi

NORMANDY
Olga Hunt
Dawn Lanning
J. Carrie Launius

NORTH COUNTY CHRISTIAN
Julie Radin

PATTONVILLE
Kristin Gosa
Jill Kruse
Leslie Jones
Renate Kirksey
Chris Cheatham
Katie Lambdin
Chris Curtis
Kim Dannegger
Vicki Martin
Amanda Denson
Andrea King
Chris Curtis
Alison O’Very
Kaylin Kirchner
Matt Parker
Chip (Paul) Ianiri
Jackie Ramey
Sarah Funderburk
Stephanie McCready
Melissa Yount-Ott

Julia Graham
Meggan McIlvaine
Megan McNulty
Kristy Santinanavat
Melanie Turnage
Stephanie Valli

RIVERVIEW GARDENS
JoAnn Klees

SAINT LOUIS PUBLIC SCHOOLS
Debra Granger
Nina Harris
Charlotte Smith

SOUldb SCHOOL
Courtney Keefe

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Kevin Stross

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Stacy Carmen
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Aubrea Grunstead
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Kayla LaBeaume
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Laura MCoy
Mary Patton
Amy Robinson
Carol Wolf

UNIVERSITY CITY
Lillian Blackshear
Gayle Campbell
Nikki Davenport
Kate Fairchild
Elizabeth Gardner
Anna Hoegemann
Aileen Jones
Daphne Owana
Torl Palmer
Monique Patterson
Precious Poole
Debbie Rosso
Vickie Stevens
Engineering Design Cycle

Section 1, Lesson 1

1. Identify Need/Problem
2. Research & Brainstorm
3. Choose Best Ideas
4. Construct Prototype
5. Test & Evaluate
6. Communicate
7. Redesign
# KWL Chart

## Section 1, Lesson 1

<table>
<thead>
<tr>
<th></th>
<th>I KNOW ABOUT BIRDS</th>
<th>I WANT TO KNOW ABOUT BIRDS</th>
<th>I LEARNED ABOUT BIRDS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>K</strong></td>
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<tr>
<td><strong>W</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>L</strong></td>
<td></td>
<td></td>
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</tbody>
</table>

Name: ____________________________  Date: ___________________
Nest Design
Section 1, Lesson 1

Name: ____________________________ Date: ________________

How was building the nest? (circle one)

- HARD
- OKAY
- EASY

I wonder about building a nest . . .

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Venn Diagram

Section 2, Lesson 2

How are parents the same or different than their babies?

Name: ________________________________ Date: __________________

Parent

Baby

DIFFERENT

SAME

DIFFERENT
Then and Now

Section 2, Lesson 3

Name: ___________________________________________  Date: ______________________

Draw a picture or write about two ways you are different now than when you were a baby.

WHEN I WAS A BABY  NOW

WHEN I WAS A BABY

NOW
Draw and Compare
Section 2, Lesson 3

Name: ____________________________ Date: ____________________

BIRD LIFE CYCLE

HUMAN LIFE CYCLE
Bird Cam Observation Sheet

Section 2, Lesson 4

Name: ________________________________ Date: ____________________

1. What do you notice? ________________________________

2. How many birds are in the nest? ________________________________

3. What is the nest made of? ________________________________

4. How many parents are in the nest? ____________________ How many babies? ____________________

5. What size are the parents? ________________________________

6. What size are the babies? ________________________________

7. What sound do the birds make? ________________________________

8. What are the birds eating? ________________________________

9. What kind of beaks do the birds have? ________________________________

10. Draw what you see:
Bird Beaks Chart
Section 3, Lesson 5

<table>
<thead>
<tr>
<th>EAGLE</th>
<th>SPARROW</th>
<th>FLAMINGO</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="source" alt="Eagle" /></td>
<td><img src="source" alt="Sparrow" /></td>
<td><img src="source" alt="Flamingo" /></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>HERON</th>
<th>KINGFISHER</th>
<th>OWL</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="source" alt="Heron" /></td>
<td><img src="source" alt="Kingfisher" /></td>
<td><img src="source" alt="Owl" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PELICAN</th>
<th>HUMMINGBIRD</th>
<th>WOODPECKER</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="source" alt="Pelican" /></td>
<td><img src="source" alt="Hummingbird" /></td>
<td><img src="source" alt="Woodpecker" /></td>
</tr>
</tbody>
</table>

Source: http://www.biologycorner.com/
Choose three birds from the cards or models. Use the chart to tell about each bird.

<table>
<thead>
<tr>
<th>BIRD</th>
<th>SIZE</th>
<th>COLOR</th>
<th>FEET</th>
<th>BEAK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

- □ Big
- □ Medium
- □ Small
## Bird Beak Buffet Data Sheet

### Section 3, Lesson 5

<table>
<thead>
<tr>
<th>STATION 1</th>
<th>STATION 2</th>
<th>STATION 3</th>
<th>STATION 4</th>
<th>STATION 5</th>
<th>STATION 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>What kind of food?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What kind of beak?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What kind of bird?</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Vocabulary Words

All Sections and Lessons

RECOMMENDATION
We recommend that students participate in investigations as they learn vocabulary, that it is introduced as they come across the concept. MySci students work collaboratively and interact with others about science content also increasing vocabulary. The hands-on activities offer students written, oral, graphic, and kinesthetic opportunities to use scientific vocabulary and should not be taught in isolation.

birds  frog
life cycle  tadpole
nest  chick
engineer  birds
offspring  egg
parent  backbone
animal  organism
feathers  adaptation
beaks  environment
feet
Additional Teacher Resources

LITERATURE LIST FOR LIFE SCIENCE: PARENTS AND OFFSPRING
1. Big Book of Baby Animals, by Nancy Jones
2. Is Your Mama a Llama? by Deborah Guarino
3. A Nest Full of Eggs, by Priscilla Betz Jenkins
4. Birds’ Nest, by Barrie Watts
5. The Life Cycle of a Bird, by Bobbie Kalman
7. Backyard Birds, by Robert Bateman
8. The Barn Owl, by Tony Johnston
9. Owls, by Gail Gibbons
10. Fine Feathered Friends, by Jane Yolen
11. Beaks! by Sneed B., III Collard and Robin Brickman

RESOURCE LIST FOR LIFE SCIENCE: PARENTS AND OFFSPRING
1. Cornell Lab of Ornithology

A TEACHER’S GUIDE TO ADAPTATIONS IN BIRD BEAKS, FEET, AND COLORS
CHRISTIAN BURNS, CORNELL UNIVERSITY

What makes a bird a bird?
• Hard-shelled, amniotic eggs
  — Hard-shelled eggs are not a trait exclusive to birds. Most reptiles and a few mammals (platypus and echidna), also lay hard-shelled.
• Fast metabolism
  — Metabolism is the process which food is absorbed into the blood stream to provide energy for the animal.
• Toothless beaks
• A lightweight skeleton
  — The bones have a hollow structure inside, like a honeycomb. This makes them lighter, and allows them to fly easier. Some birds can’t fly because they are too heavy, such as ostriches (300 lbs!) and penguins.

• Feathers
  — A feather is a skin covering, like hair or fur, that is exclusive to birds. They are made of keratin, which is the same thing found in fingernails. They can be used for flight, warmth, and for display.

How many birds species are there that we know of?
9,799 living species of birds have been discovered so far. There are more bird species than there are mammals, amphibian, or reptile species!

Where do birds live?
Birds can be found on every continent and in every environment, except for the open oceans (although some birds live almost entirely on the surface of the water for most of their lives).

What do birds eat?
Almost everything on Earth is a potential food resource for birds.

Some birds are exclusively herbivores (plant eaters), eating grass (e.g., ostrich, chickens), leaves (e.g., mousebird, hoatzin), nuts (e.g., finches, grosbeaks, corvids — crows, jays), fruit (e.g., quetzals, toucans, hornbills, cedar waxwings), nectar (e.g., hummingbirds, orioles), and seeds (e.g., several passerines (songbirds). Some herbivorous birds use oddly shaped bills to eat pinecone seeds (e.g., American crossbill).

Many birds are carnivorous (meat eaters), eating insects (e.g., warblers, flycatchers), worms (e.g., thrushes, robins), mollusks (e.g., many shorebirds), small animals including rodents and birds (e.g., raptors such as hawks and owls), fish (e.g., other raptors such as osprey, as well as terns, skimmers, gulls), and carrion (e.g., vultures).

Some birds are omnivores, eating both plant and animal material. These include crows and gulls, as well as other opportunists.

How can birds eat all those different things?
Beaks are adapted to best take advantage of a specific food source. Each bird species has a different beak shape.

What other features do birds have that are adaptations?
The feet, plumage color, wing shape, and feather type are all adapted to a bird’s environment. Even eggs can adapt to be more hidden in the environment.
How are beaks adapted to a bird’s diet?

Fish eaters (piscivores): some have pouches to carry fish in (pelicans — pouches can hold 9 gallons of water); some have spears and either dive at fish from height to stab them or to snap them up (kingfishers, terns), or stand in the water and wait, then stab them (egrets and herons); some have enlarged lower mandibles and skim on the surface to look for fish (skimmers); other have hooked beaks to rip fish apart (fish-eating raptors).

Invertebrate-eaters: Many sweep bills through the water to try and feel for invertebrates. When prey is sensed, the bill snaps closed in a reflex and the bird swallows the animal; some have sensitive combs inside the mouth and use them as filters, eating like baleen whales, sifting out water while retaining the invertebrates (flamingo); others have a spatula-like bill (spoonbills) or long thin bills for probing either on the surface of the water or plunging their bills in the mud for worms and other invertebrates.

Meat-eaters (carnivores) have hooked bills to rip prey apart (raptors, shrikes).

Nut-eaters have heavy bills with thick bases to crack open nuts (finches, sparrows, grosbeaks).

Insect-eaters (insectivores) have thin toothpick or tweezer-like bills to pick up prey and hold it tightly. Some insectivores have big, wide, gaping mouths to catch insects in the air (swallows and swifts).

Nectar-eaters usually have long, thin bills with long tongues for reaching deep into flowers for nectar.

Some exceptions to the rule: lorikeets (a variety of parrots) have short tongues with bristles on the end to suck up nectar like a sponge; orioles have tweezer-like beaks. Orioles are insectivores, but they also eat fruit and will take nectar from flowers if they get the chance.

Special cases: some birds are highly specialized to their diet, so much so that no other bird eats that food. Crossbills eat the seeds of young pinecones, and get to them by prying cracks open with their oddly-shaped bills, which can move side to side, allowing the bird to hold the pinecone “open” while its tongue reaches the seeds and draws them out. The opposite of these specialized feeders are those that can eat many different food types because have no specific beak shape and therefore have a varied diet. These are the generalists, which include gulls, crows, and chickens.

Adaptations in bird feet

Aquatic and semi-aquatic (live on water, nest on land) birds have webbed feet with small claws to swim. Some birds have their legs and feet set towards the back of their bodies so that they work as propellers (grebes, loons).

Arboreal (tree living) birds have gripping feet, sometimes zygodactylic (two toes in the back, two in the front) to really grip on to the branch or trunk. The claws are usually long and curved to grab onto the branches, especially in parrots and woodpeckers.

Raptorial feet (carnivorous) have long, curved claws to hold onto prey and rip it to shreds.

Primarily aerial birds usually have small feet in comparison to body size, because they do not need to perch in trees or on the ground for food (hummingbirds and swallows).

Ground birds usually have flat, non-remarkable feet, sometimes with sharp talons for defense (cassowaries), or sometimes with less than the average four toes (ostriches have two). Usually ground birds are fast runners.

Color Adaptations:

• Birds use color for mating displays (peacocks, blue-footed booby, manakins)
• Birds use color for camouflage (the potoo is a good example for this).
• Birds use it for threatening displays (sunbitterns).
• Birds use warning colors:
  — Aposematic coloration is used to warn predators that the animal is poisonous. There is only one poisonous bird: the pitohui of New Guinea.

Why is it so important that birds have these adaptations?

If birds didn’t have these specific adaptations, their survival would be reduced.

Guam is the only island without birds on it. This is because of the accidental introduction of brown tree snakes during WWII. Because there are no birds on Guam, the insect and spider populations have ballooned out of control. Birds are an important part of the ecosystem, and they need to be protected for that reason.