Unit 3.3: How can we help the birds near our school grow up and thrive?

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Enduring Understanding – *Students will apply the following ideas to explain phenomena or design solutions to problems they experience in their environment:* Organisms have **characteristics**, including traits, behaviors and life-cycles, that result from interactions with the **environment** and **genetic** materials being passed down from parents. Organisms with certain characteristics are better able to survive, reproduce, and cope with change in the environment than organisms that lack these characteristics.

Generalization(s)
Environmental and genetic factors influence an organism's characteristics (traits, behaviors, and life cycle).
Traits come from the parents. (genetic factors)
Certain characteristics/traits allow success.
The environment influences traits.

Overarching Phenomenon (Unit Level)

Final Artifact: Throughout the lessons, students design bird feeders that take into account the physical and behavioral traits of the bird they are concerned with, the changing weather, the features of the environment, and the needs for reproduction of the focal bird.

Primary PEs addressed in this unit

3-LS3-2 **Use evidence to support the explanation that traits can be influenced by the environment.**
LS3.A Inheritance of Traits. Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.
LS3.B Variation of Traits. The environment also affects the traits that an organism develops.

3-5 ETS1-3 **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.**

3-LS3-1 **Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and the variation of these traits exists in a group of similar organisms.**
LS3.A Inheritance of Traits. Many characteristics of organisms are inherited from their parents.
LS3.B Variation of Traits. Different organisms vary in how they look and function because they have different inherited information.

3-LS2-1 **Construct an argument that some animals form groups that help them survive.**
LS2.D Social Interactions and Group Behavior. Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size.
Building toward these Additional Related DCI Components (reworded)
ESS2.E Biogeology. Living things can affect the physical characteristics of their [environment]. (Reworded from DCI text in 4-ESS2-1)
ESS3.C Human impacts of Earth Systems. Societal activities have had major effects on the land, ocean, atmosphere, and even outer space. Societal activities can also help protect Earth's resources and environments. (Reworded from DCI text in 5-ESS3-1)

Secondary PEs addressed in this unit

3-LS1-1 **Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.**
LS1.B Growth and Development of Organisms. Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles.

3-LS4-2 **Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.**

LS4.B Natural Selection. Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

Integration Planning

The Bird Unit's 6 Learning Sets include 32 Lessons representing the equivalent of 39 fifty-minute class sessions. Of the 32 lessons, guidance is provided to integrate part or all of 16 (+2 optional) lessons in class time devoted to literacy (12 lessons; ~10-12 50-min class sessions) or mathematics (8 lessons; ~4-6 50-min class sessions). (See blue text for instructional minutes for each lesson.)

LS 1 What birds do we see around our school and how do they look?

L1.0 *(Optional) What can we learn from the Cornell Lab of Ornithology website?*

L1.1 *What birds do we see around our school? (85 min: 55 min of science and 30 min in literacy block.)*
Students predict what birds they will see and then go outside to look for birds. They use a website to identify the birds they saw, and use the map to figure out if they are commonly found in the area at this time. They add questions to the DQ board and pass out homework assignment for Lesson 1.5.

L1.2 *How can we describe the birds around our school? (85 min: 55 min of science and 30 min in literacy block.)*
Students are introduced to the local birds, some of which they saw in L1.1. They look for these birds outside. The students are introduced to the Shared Trait Chart, and use photos to discuss and compare traits of these birds. In groups, they generate questions to look up on the Cornell website and add to the Shared Trait Chart. Students free-write an initial response to the unit DQ.

L1.3 *How can we classify the birds that live near our school? (55 min)*
Students analyze the data they have collected about the focal birds using the Shared Trait Chart and photos. In groups they come up with a classification system for birds, and learn that ornithologists classify birds using physical and behavioral traits, and habitat.

L1.4 *Which traits of female and male cardinals are similar and which are different? (55 min)*
Students look at male and female cardinals and ask questions about why some traits might be the same and some traits might be different. First with support from the teacher, and then in pairs, the students use information from media to create a Venn diagram of the male and female traits. They make a claim that some traits are similar and others are different and write in their notebooks why they think male and female cardinals have similar beaks but different coloring.

L1.5 *How are the traits of a red-tailed hawk and a black-capped chickadee simlar or different? (55 min)*
Students observe a red-tailed hawk and a black-capped chickadee and draw pictures, discuss these birds' similarities and differences of traits and make a Venn diagram with a partner. The class discusses why some traits are similar and different between these birds. The class adds new question, and vocabulary to the DQ Board.

L1.6 Equity *What can we learn about birds from our families? (55 min -- This lesson could be taught in literacy block.)*
Students share the birds that they wrote about from their interview. They compare the resources and experiences and histories that are available in the class to get different information and ideas. Then they write in their notebooks about something they learned that was interesting.

L1.7 (*Optional*) Math *Can we figure out where a bird lives by looking at its traits? (55 min. May be taught in math block.)*
In pairs, students use a plastic fork and a cup of apple juice to discuss how they might need specific structures to "drink." They observe a variety of habitats and select bird features that would "fit" the habitat and construct claims. They use math to describe the birds that are more likely to live around the school, and compare these birds' observed physical with the birds from the Florida Everglades.

LS2 What does this neighborhood offer birds to eat?

L2.1 *What do our local birds eat? (55 minutes, can be taught in literacy block.)*
Using observations and field notes, if possible, and videos, students collect data about the connection between bird traits and food. Then they engage in text to check their prediction. Students share with the class what they learned, and the class puts together an evidence-based claim about one bird and the traits it has, and how the traits are connected to the food it eats.

L2.2 *How does the shape of the bird's beak "fit with" what the bird eats? (55 min, Last 20 minutes could be taught in literacy block.)*
Students review the Driving Question. They observe the various structures of birds in the Shared Trait Chart and discuss if they can tell by the structures of the birds in the neighborhood might eat the same things. The students sort photos of the birds and describe patterns in structures, and then read the book Beaks. They predict what a pelican might eat based on its structures.

L2.3 *Are there some foods birds eat that they can't find all year? (55 min)*
Students do a habitat inventory in the area around their school, looking for food resources that they have on the Shared Trait Chart. They ask if there's a resource missing that birds need. They write a problem they want to solve about a focal bird not having access to a resource. Each group defines a problem centered on the bird about which they develop expertise throughout the unit.

L2.4 SEL *What problem do some birds in our neighborhood have, and how should we solve it? (55 min)*
Students revisit the problems in 2.3 and focus on them: Write the problems on sentence strips, ask questions, and comment, and group them together. They watch a short video of a boy who persists in solving a problem. Each group develops an engineering plan for their problem with respect to the criteria and constraints and shares the solution with the class.

L2.5 Math *Do some birds leave the area as the seasons change? (55 min, Could be taught during math block)*
Students use websites to contribute to and analyze the Shared Trait Chart showing which birds are around all winter and which ones aren't (migrate south for the winter). They use a map, ruler, and information about the Red-winged Blackbird to answer math problems. They consider why birds might migrate.

LS3 How do our birds get what they need to grow and thrive *all year?*

L3.1 *What can birds eat during this season? (55 min)*
Students conduct a field study of the signs of spring in the area and then make predictions about what is available during other seasons of the year. They consider if some resources are available only in certain seasons. They develop a claim that the resources available are the resources the birds need to survive.

L3.2 *Why do only some birds respond to the change in season by migrating*? *(55 min)*
Students develop a phenology wheel for their local place, and compare it to a phenology wheel from Florida. They ask questions about opportunities for birds to find resources elsewhere. They do a *quick write* about why it might make sense for some birds to migrate and others to overwinter.

L3.3 *Do all migrating birds have the same migration patterns? (55 min. Could be taught during literacy block)*
Students analyze the online resources for information about their case study birds who are highlighted in their problem statements. They analyze data and share migration information for their own birds. They consider the bird behavior as related to a system, which includes the birds' needs, changing seasons, and the environment.

L3.4 Equity *Do people migrate for the same reasons as birds? (55 min. Could be taught during literacy block)*
In groups, or whole class, students read and discuss a story about a family who moved because of lack of resources. Students ask the question, "Who needs to move because they don't have resources?" They do a free write, to the prompt, "*Do people move or "migrate" for the same reasons as birds*?"

L3.5 Math *How do birds migrate? (55 min. Could be taught during math block)*
Students play a game about migration and connect the experience to the engineering problem focal birds that they have expertise in, and their problem and solution statements. They consider and discuss the hazards to birds that are related to migration. The students groups build their engineering solutions, deciding if they need to modify the problem or the solution, based on the new information.

L3.6 Math *How do scientists study (collect and analyze data about) how birds navigate? (55 min. Could be taught during math block)*
Students watch a film about the snowy owl, and argue that birds' migratory behavior may change if the environments and the seasons change. Students use the graph to find a bird (birds) that isn't getting a resource it needs and then devise a plan for helping that bird. They use an empty milk jug to make a bird feeder. Students choose from a list of problems they defined in 2.4. consider their own birds to revise bird feeders based on the new information.

LS4: Can our birds' behavior help us figure out where our feeders should go?

L4.1 *Where should we place our bird feeders? (55 min, and 70 minutes of Literacy)*

Students go outside to observe and record bird behavior. They consider their bird-feeder engineered designs with respect to new information gathered from online resources. They discuss where optimal locations for placing the bird feeders might be, synthesizing their bird's feeding and foraging behaviors with "niche level diagrams" used by ornithologists.

L4.2 *Do birds ever act together, and if so, why? (55 min, and 20 minutes of Literacy)*

Students use video and text to model the social behaviors of territorial and warning calls. They make the claim that social behavior may help some birds survive. Then they consider if the bird in their engineering challenge has a specific behavior that helps it to survive.

L4.3 *How are the behavioral traits of our engineering problem focal bird different from those of other birds? (55 min)*

Students collaboratively write down the behavioral traits of their birds. Then they describe their engineering challenge focal bird's behavioral traits to their peers as audience, and use "like my bird" and "not like my bird" to compare across the case study birds in the classrooms. In pairs they analyze the data to fill out a Venn diagram of two birds to compare traits.

L4.4 Math *What is a day like in the life of a bird? (55 min)*

Students comprehend text about diurnal, nocturnal, and crepuscular. They consider why a bird might be able to find certain resources and / or experience less competition, based on these (temporal) niches. The students create a day's schedule of behaviors for diurnal, nocturnal, and crepuscular birds. They develop and solve elapsed time problems.

L4.5 SEL *How do we decide where we should place our bird feeders? (55 min)*

Students synthesize all the relevant data to determine where their bird feeders should be placed outside.

LS5: How do the different traits of birds of the same species help or hinder survival?

L5.1 *Do bird siblings have exactly the same traits? (55 min. Could be taught during literacy block)*
Students engage in a text about two birds and analyze the differences between them and if differences might hinder or help chances of thriving.

L5.2 *Why do hawks with long wings and tails thrive in different habitats than hawks with short wings and tails?*
Students observe two very different environments and make claims that differences in traits benefit hawks of the same species in different environments. *(55 min. Could be taught during literacy block)*

L5.3 Math *Do differences in traits affect how well birds can survive in different places? (55 minutes of science which could be taught during literacy block and 20 min to be taught during math block)*
Students interact with a close read for the real study about traits of Cooper's Hawks separated by mountains for hundreds of years. They consider the purpose for scientists studying traits, and also why scientists write and read in their careers.

L5.4 *What traits might be different among our engineering problem focal birds? (55 min.)*
Students revisit their engineering solution and examine their bird feeder in its location. They use the photos of their birds, and the Internet research site and their new understandings of traits to describe differences that they might see between birds in the same species. They imagine if the trait differences are a benefit or not and include the description in their design solution folder. And they take a written assessment.

LS6: Will our birds need to eat different things at different ages, and during different times of the year?

L6.1 *Are the birds near our school chicks, juveniles or adults?*
Students go outside to ask questions and take field notes to collect data about the "ages" that the birds might be around the school, and where the chicks and juveniles might be. Students will be taking field notes, collecting observations, and asking lots of questions.

L6.2 *Do all of our engineering problem focal birds go through the same life stages? (55 min. Could be taught during literacy block)*
Students engage in text and media to get a closer look at their bird's stages of development. They use the data they collect to compare the stages of development of their bird to those of another bird.

L6.3 *How is our bird's life cycle unique?*
Students work together in partners or their small case study group to make a model of their case study bird's life cycle in their own design. In their model they show how their bird interacts with the environment near the school. Using physical and behavioral traits.

L6.4 *How do we add our bird feeder to the model? (55 min. Plus 20 min to be taught during literacy block)*
Students use the model to describe how the feeder may be an important part of the bird's growing up and thriving, at least during one stage of development. They read a text about more ideas how to help birds.

L6.5 Equity *Why do scientists' life cycle models look different from our models?*
Students look at a scientist's life cycle of a Chickadee and figure out how and why it might be different from their life cycle models. The students plan to share or display their models.