EGG PREDATION – Teacher's Guide

DESCRIPTION:
Students investigate the effects of bird nest location on nest predation rates using clay eggs in an artificial nest. Potential nest predators leave marks on the clay eggs that can then be examined.

GRADE LEVEL:
7th

OBJECTIVES: Students will:

- Record the occurrence and type of egg predation.
- Relate egg predation to nest location.

NEXT GENERATION SCIENCE STANDARDS:

This activity supports the following Performance Expectation:

MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

This activity is aligned with the three-dimensional learning model of NGSS.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Planning and Carrying Out Investigations Analyzing and Interpreting Data	LS1.B Growth and development of organisms LS2.A Interdependent relationships in ecosystems	Patterns Cause and Effect

COMMON CORE STATE STANDARDS:

English Language Arts

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Mathematics

7.RP.A.2. Recognize and represent proportional relationships between quantities.

BEST PAIRED WITH AMPLIFY:
Traits and Reproduction Unit

MATERIALS:

- Egg Predation Student Handout [1 per student]
- Non-toxic oil-based modeling clay
- Plastic gloves [1 pair per student]
- Bird nests [1 per group]
- Wire [1 per group]

BACKGROUND:

Birds lay eggs and rear their young in nests which may be found in many locations including trees, shrubs, cactus, cliffs, birdhouses, on the ground, and in roof eves. Most nests are used only once by a breeding pair. However, birds such as osprey and eagles use the same nest year after year adding another layer of twigs and sticks to make the nest larger. Other species, like the great horned owl will use an old hawk's nest or cavity-dwelling birds will use old woodpecker holes.

A clutch of eggs, a single laying of eggs, may be a single egg (seabirds and vultures), a couple of eggs (song birds), or a dozen eggs (quail and water fowl). Many of the smaller songbirds will lay two or more clutches in a season. This rapid process may have the male feeding the young while the female is laying another clutch.

Egg color is as varied as the egg size. Brightly colored eggs are laid where they will stand out in daylight so the parent can spot the eggs upon returning to the nest. Their nests are located in foliage or thick cover to help hide them from predators. Eggs laid in open nests or nests on the ground are colored to camouflage into their surroundings. White or off-white eggs are generally laid in hollows or burrows.

Factors such as food and water proximity and safety are taken into consideration for the location of the nest. However, nest predation is the primary source of nest failure for birds on land. Predators can be mammals or other birds. In most cases, the predators feed on the eggs. With some bird species, mature birds eliminate eggs of other birds and either steal the nest fortheir own use or lay their eggs and have the host bird raise the young. The cowbird is a well-known culprit of this. The cowbird will lay its eggs in an unsuspecting host's nest. When the young hatch, they are usually larger than the original resident hatchlings and out compete the original hatchlings for food and space. The cowbirds are raised by the unsuspecting host parents.

Chicks are divided into two categories of development: altricial and precocial. Altricial chicks are born with no feathers and closed eyes. They are fed and cared for by their parents. Precocial chicks have different levels of development but generally hatch with downy feathers, their eyes open, and are able to leave the nest and feed after hatching.

TIPS FOR ENTIRE CLASS PARTICIPATION:

- Break the class into four to ten groups. Each group makes one nest and clay eggs and is responsible for tracking that nest throughout the study. Half of the groups place their nests in the first location type (e.g., in shrubs) and half of the groups place their nests in the second location type (e.g., in trees).

PROCEDURES:

1. Have students walk around the schoolyard and try to locate nests. Ask them about the pros and cons of the nest locations. Have them study the shape of the nests so they are familiar with what type of nest is common for their chosen site. Have students hypothesize about which nest location will have a higher risk of predation and write it on page 1 in their worksheet (e.g., high in a tree versus low in a shrub, on a bare branch versus on a heavily vegetated branch). Discuss how the clay egg and nest will be used as a model of a real bird nest.

2. Have students choose two different locations to test (e.g., in trees, in shrubs, on the ground, etc.). Place one nest per site and two to five nests in each location type. For example, if students choose to test nests in pine trees versus nests in shrubs, place two to five nests in pine trees (no more than one nest per tree) and two to five nests in shrubs (no more than one nest per shrub). If the sites require a ladder, ask a school maintenance worker for assistance.

Make the Clay Eggs and Nest

3. To begin construction, have students ball up a piece of wire to form the center of the clay egg. Leave a "tail" on the wire approximately 3 inches long to secure the clay egg into the basket. See Figure 1.

4. Have students firmly layer clay over the wire into an egg shape. The egg should be left with a smooth surface, just like a real egg. Make sure the eggs are not too large. Most small eggs are about 1/2 to 3/4 of an inch long.

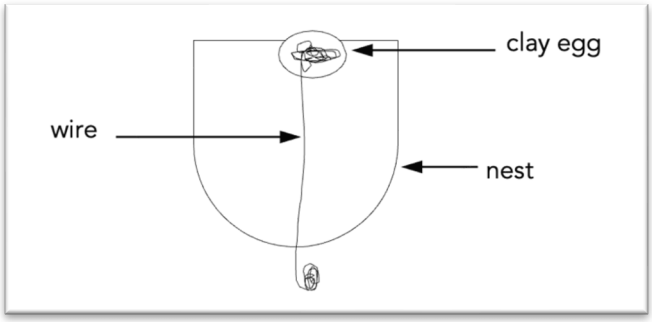


Figure 1. Experiment set-up.

5. Poke the wire "tail" attached to the egg through the bottom of the nest and make a knot in the wire, securing the egg into the nest. Caution students not to pull on the wire too hard, as it will pull through the bottom of the nest.

Collecting The Data

6. Have students place the nests with eggs outside, in the locations they chose. Remind them to record the location of their nest on the Egg Predation Data Sheet.

7. Every school day, have students check their nest, without excessive handling of the nest, and record their findings on the Egg Predation Data Sheet. See Figure 2 for an example of what students may observe.

a. If the clay egg looks like it has been pecked at or has a beak-shaped indentation, indicate bird predation.
b. If the egg has teeth marks, indicate mammal predation.
c. If the egg appears untouched, record no predation.

8. Remove nests that have had predation, but leave the non-predated nests in place.

9. At the end of two weeks, have the students remove any remaining nests.

10. Have students record the number of days it took for each nest to have predation on the Class Egg Predation Rate Chart. Use these values to calculate an average number of days to predation in the two different location types. See Figure 3 for an example of what students may write.

Egg Predation Data Sheet

Location of nest: In the desert willow tree in front of the school

Date nest was placed: April 4, 2022

Nest number: 1

Date	Days Since Nests Were Placed	Type of Predation
April 5, 2022	1	No predation
April 6, 2022	2	No predation
April 7, 2022	3	No predation
April 8, 2022	4	No predation
April 11, 2022	7	Mammal predation

Figure 2. Egg Predation Data Sheet Student Sample

Class Egg Predation Rate Chart

Nest Number	Day of Predation	
	Location: tree	Location: ground
1	5	5
2	12	5
3	14	8
4	7	12
5	14	8
Average	10.4 days	7.6 days

Class Egg Predation Type Chart

Nest Location	Number of Eggs	Amount of Predation			Percentage of Predation		
		Bird	Mammal	No Predation	Bird	Mammal	No Predation
tree	5	2	1	2	40%	20%	40%
ground	5	1	2	2	20%	40%	40%

Total Number of Eggs: 10

Figure 3. Class Egg Predation Rate and Type Chart Student Samples

11. Have students work together with their classmates to fill in the Class Egg Predation Type Chart. Graph the percentages of eggs with no predation or predation by mammals or birds on the Egg Predation Graph. See Figure 4 for an example of a graph.

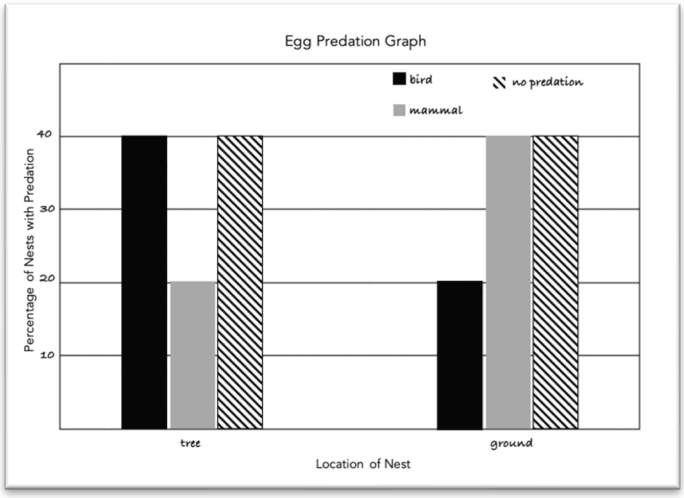


Figure 4. Egg Predation Graph Student Sample

CONCLUSIONS:

Allow students to draw conclusions from their graphs. Students should answer the following:

- How long did it take for predators to find the nests in each location?
- How does the nest location affect the type of predation at the nest?
- What other factors could affect nest predation?

EXTENSION:

Other variables that could be studied include nest construction (e.g., open nest of sticks, open nest of grass, closed nest of grass, or closed nest of clay), and egg characteristics (e.g., different colors of eggs, patterns on eggs, number of eggs).