

Problem-Based Learning

Project Site

High School

Life Science: Biology

SC11907

 **Wake Forest**[®]
School of Medicine



Project Site

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Life Science: Biology

Overview

You are a research assistant for an ornithologist who has been asked to help in the development of a new shopping center. Students will explore concepts related to ecosystems.

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PBL Problem Guide

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Timeframe

This lesson plan will take approximately 3 hours.

Step-by-step guide

- Put students into teams of three to five members.
- Ask for a volunteer to read the STUDENT PROBLEM PART ONE aloud [page 6].
- As a whole group, ask students to list What We Know [FACTS, page 8].
- Have each team create a list of What We Need to Know [NEED TO KNOWS & LEARNING ISSUES, page 9].
- Ask for a volunteer to read the STUDENT PROBLEM PART TWO aloud [page 7].
- Repeat bullets three and four.
- Have each team begin a list of POSSIBLE HYPOTHESES [page 13].
- Allow teams to research LEARNING ISSUES [pages 9 & 12].
- Teams re-evaluate POSSIBLE HYPOTHESES [page 11] and determine one DEFENDABLE SOLUTION for Final Product [page 13].
- Teams create and present DEFENDABLE SOLUTION and individual students write ACTION PLAN [page 13].

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PBL Resources

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Resources provided

Included with this case are:

- Virtual Owl Pellet Dissection website
- Barn Owl Science website
- Barn Owl Pellet Lab website
- All About Birds: Canada Goose website
- Population Biology website
- Ecological Pyramids website
- Population Study Game website
- Predator Prey Simulation website

Resources to assemble

You may wish to assemble the following resources ahead of time:

- Biology textbooks
- Owl pellets for lab

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Student Problem Part One

FOR STUDENT USE

You are a research assistant to a well-known ornithologist with the Federal Wildlife Agency! His latest research project involves evaluating the possible effects of a shopping center in the area.

There are two sites available.

One site is easily accessible to traffic and is most likely to attract customers quickly. However, there is a family of protected Barn Owls located on the property. In order to use this site, these animals must be successfully moved to a park in the area.

The second site is away from the bustle of activity and may not be as attractive to customers. There are no established communities living on it as it was previously developed and the structures there were taken down five years ago. There is a group of Canadian Geese that continue to come by this site in large groups during some parts of the year, but those numbers decrease each year.

Consider:

- What are the possible ecological impacts of each site?
- What additional information would you like to have?
- How would that information help you with your research?

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Student Problem Part Two

FOR STUDENT USE

The officials at the park where the Barn Owls would be relocated are insisting on a report that describes how the Barn Owls will affect the native species at the park and its existing ecosystem.

The ornithologist asks that you to put together three reports for him to look at:

1. A description of the ecosystem at site one and the impact of using this site.
2. A description of the ecosystem at site two and the impact of using this site.
3. A report on how introducing the Barn Owls would affect the existing population at the park.

Usually, you just prepare the reports while your boss gets all of the credit. However, this time he will be out of town at the Annual Ornithologist Convention, so he has asked you to present to the building committee! Not only do you get to present the research, but you also get to make a recommendation about which site is best.

Consider:

- Which site do you think you will recommend?
- What impact will it have on the community?
On the ecosystem?
- Do you think that economics (the money a shopping center might generate) or ecosystems are more important to a community?

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Key Facts

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PART ONE

- You are a research assistant to a well-known ornithologist with the Federal Wildlife Agency.
- His latest project involves evaluating the possible effects of a shopping center in the area.
- There are two sites available.
- Site one has the best customer appeal, but also a family of Barn Owls that must be moved.
- Site two has less customer appeal, but only occasional Canadian Geese in the area.

PART TWO

- Officials at the park where the Barn Owls will be relocated want a report on how the Barn Owls will affect the native species and existing ecosystem there.
- The ornithologist asks you to put together three reports: the impact of site one, the impact of site two, and the impact of moving the Barn Owls to the park.
- Your boss will be out of town so he has asked you to present to the building committee and make a recommendation about which site is best.

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Need-to-knows / Learning Issues

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NEED TO KNOWS

- Where are the locations?
- Where is the park?

LEARNING ISSUES

- What are Barn Owls?
- How do Barn Owls survive?
- How does moving a species affect the food chain of the two areas?
- How do Canadian Geese survive?
- Why do some of the geese continue to return to the area?
- What is the process to capture and relocate a species?
- How effective are relocations?

NEED TO KNOW ANSWERS

- The facilitator may make up answers to these questions based on locality.

LEARNING ISSUE RESOURCES

- Students will investigate using the Learning Issue Resource Guide, page 12.

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Additional Information

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There are multiple ways for teams to approach this case. Allow teams to ask the questions before moving to the next step.

When teams ask what Barn Owls eat, provide the Barn Owl pellet lab activity.

Teams may complete activities at different stages in the problem.

FACILITATION TIP

Remind teams that environmental groups could make the process difficult and costly if they put the ecosystems at risk.

CORRELATING ACTIVITY

The virtual and hands-on owl pellet labs both have value in this activity.

The virtual lab has quick identification methods, so teams can quickly see what the animals consume. Also, there is a short video of the owl eating.

The hands-on lab shows students that more than one organism could be in one pellet. It also shows broken bones, which demonstrates the force of the digestion.

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Hypotheses

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- Hypotheses will vary by the site recommended and the reasoning and research to support the recommendation.
- Hypotheses will vary by how teams present their research to the building committee.

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Learning Issue Resource Guide

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WEBSITES

Virtual Owl Pellet Dissection

www.kidwings.com/owlpellets/flash/v4/index.htm

Barn Owl Science

www.barnowltrust.org.uk/content_images/pdf/Science_Food_web.pdf

Barn Owl Pellet Lab

www.tuskegee.edu/sites/www/Uploads/images/Research/MSP/Barn%20Owl%20Pellet%20Lab.pdf

All About Birds - Canada Goose

www.allaboutbirds.org/guide/canada_goose/lifehistory

Population Biology

www.mhhe.com/biosci/genbio/virtual_labs/BL_04/BL_04.html

Population Fluctuations in an Ecosystem

www.lakesc.lake.k12.ca.us/lessons/pdf/Grade6_PopulationsWithinEcosystem_TLC2009.pdf

Population Study Game

www.riverventure.org/charleston/resources/pdf/population%20study%20game.pdf

Ecological Pyramids

www.biotopics.co.uk/newgcse/ecologicalpyramids.html

Predator Prey Simulation

www.biologycorner.com/worksheets/pred_prey.html

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Final Product and Writing Guide

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Team

- Each team will research the impact of both sites and decide which site to recommend. Teams will present their recommendations to the building committee. Reports will be verbal and should have visuals to make them easier to understand.

Individual

- Each student will write a memo to their boss, the ornithologist, explaining their findings and recommendations.

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Rubric

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AREA	ABOVE AVERAGE Three points each	AVERAGE Two points each	BELOW AVERAGE One point each	NO EVIDENCE Zero points each	POINTS
Final Product	<ul style="list-style-type: none"> All Learning Issues addressed Three or more hypotheses present High quality final product 	<ul style="list-style-type: none"> Most Learning Issues addressed Two hypotheses present Roles somewhat defined Fair quality final product 	<ul style="list-style-type: none"> Few learning issues addressed One hypothesis present Low quality final product 	<ul style="list-style-type: none"> No learning issues addressed No hypotheses present No final product 	
Writing Assessment	<ul style="list-style-type: none"> Problem Summary, Learning Issues/New Information Integrated well presented Hypotheses well presented Solution and Defense well presented 	<ul style="list-style-type: none"> Problem Summary, Learning Issues/New Information Integrated presented Hypotheses presented Solution and Defense presented 	<ul style="list-style-type: none"> Problem Summary, Learning Issues/New Information Integrated poorly presented Hypotheses poorly presented Solution and Defense poorly presented 	<ul style="list-style-type: none"> Problem Summary, Learning Issues/New Information Integrated not presented Hypotheses not presented Solution and Defense not presented 	
Collaboration	<ul style="list-style-type: none"> Individual works well with group members Individual communicates well with group members Individual carries out their individual responsibilities 	<ul style="list-style-type: none"> Individual works acceptably with group members Individual communicates acceptably with group Individual mostly carries out their individual responsibilities 	<ul style="list-style-type: none"> Individual does not work well with group members Individual does not communicate well with group members Individual attempts but fails to carry out their individual responsibilities 	<ul style="list-style-type: none"> Individual interferes with group members Individual does not communicate at all Individual does not attempt to carry out their individual responsibilities 	

24 – 27 Points = Above Average

15 – 23 = Average

6 – 14 = Below Average

0 – 6 = Failing

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provides essential case studies to K–12 teachers across the United States. Access useful and easy-to implement case studies on Math, English Language and other STEM topics online at www.wakeproblembasedlearning.com.



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