



# Investigation 4

## Plan and Conduct My Investigation

### Before You Start



#### Time and Place

50 minutes for introduction  
Time outside/inside class for students to create their plan and get your approval  
Ongoing time for research and investigation  
Introduction is indoors.  
Research is primarily outdoors.

### MATERIALS NEEDED

#### Resource Pages

- “Annalisa’s Report” research report

#### Journal Pages 12–17

#### Other Curriculum Components

- None

#### You Provide

- Research materials (such as books, Internet access, field guides)
- Computer with Internet access

### Getting Ready

- Make copies of “Annalisa’s Report” for each student
- Decide on the format of your students’ investigations.
- Assign due dates for the various parts (**JOURNAL PAGE 12**).

### Goal

Students will design and conduct their own inquiry investigation.

### Learning Objectives

1. Students will be able to design a study to answer a scientific research question.
2. Students will be able to collect data and information that addresses their research question.
3. Students will be able to draw an evidence-based conclusion.

### Lesson Outline

1. Brainstorm ways to present findings.
2. Read Annalisa’s report and examine the parts of it.
3. Prepare a project plan.
4. Collect and analyze data and information.

### Conducting the Activity

#### 1. Brainstorm ways to present findings.

Ask students to brainstorm ways that scientists might share their findings. If they struggle, you could remind them of the “Meet the Scientist” reports they read, and any experience they have in sharing scientific findings (perhaps at a science fair). Make sure that students mention

- Written reports (for example, in magazines, via the Internet, in newspapers or newsletters, and in scientific journals)
- Oral presentations (at a symposium or conference)
- Displays (in a poster, for instance).

#### 2. Read “Annalisa’s Report.”

Pass out a copy of “Annalisa’s Report” research paper on chickadees to each student (**RESOURCE PAGES 23-24**). Give students 10 minutes to read her report individually or in pairs, asking them to pay close attention to the sections of the report in bold and the information found in each section. After students have finished reading, record information about these parts of her report on the chalkboard in



# Plan and Conduct My Investigation

a table similar to “Scientific Report Components” (see page 29).

Tell the students that by including this information in each section, Annalisa was able to organize her ideas and make sure that her report was complete. Whether students do a written report, oral presentation, or poster, including these sections will help them to stay organized and make sure their project is complete.


### 3. Prepare a project plan.

Invite students to take part in a scientific investigation and presentation, starting with one of their questions about birds. Ask students to look at the project checklist on **JOURNAL PAGE 12** to review the process they will use:

- Identify a researchable question related to birds, then develop a hypothesis that can be tested with the time and resources you have.
- Read about what you are studying for background and summarize what you learn. Write down citation information for the resources you use.
- Outline your method, which may include designing an experiment, collecting data, accessing eBird, or gathering other information.
- Do your study, collecting any necessary data and information.
- Organize the data you collect in tables and graphs. Consider analyzing the data.
- Create a first draft of your scientific poster, presentation, and/or report.
- Go through a peer-review process and edit your work based on feedback.
- Communicate what you did and what you learned through a final scientific poster, scientific paper, oral presentation, and/or research report.

Note: Parts a–e are covered in this lesson (Investigation 4) and parts f–h are covered in Investigation 5, “Present My Inquiry Project.”

## RESOURCE PAGE 24



### BIRD Sleuth

## Annalisa's Report

**The Effect of Temperature on Chickadees**  
by Annalisa, 10<sup>th</sup> Grade  
Tualatin Valley Junior Academy, Hillsboro, OR  
Mr. Kahler

**Introduction**

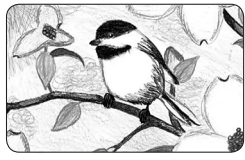
I decided to study Black-capped Chickadees and Chestnut-backed Chickadees observed at our feeding station. Both birds are found in mature forests near streams, which makes Downy Creek (near my school) the perfect haven for these active birds. I wanted to know if the temperature affected the number of birds seen eating at our feeders. I predicted that on colder days, I would observe more chickadees than on warmer days. I based this prediction on the fact that spiders and insects—the main food of these little birds—are scarce when it's cold, causing the birds to seek food from feeders.


**Materials and Methods**

I observed the feeders at the bird blind in the wooded area behind the school on 13 different days from November through March. At Downy Creek, we offer birds a variety of birdseed in feeders and on the ground, and suet at feeders hanging from several trees. On each data collection day, my biology class would write weather information on our bird tally sheets, walk to the bird blind, count birds, and compare data. Then we entered the information on the web site. Each bird watch was about 15 to 30 minutes long and took place in the afternoon around 2:30 P.M.

**Results and Analysis**

The greatest number of Black-capped Chickadees seen on an observation day was three. The greatest number of Chestnut-backed Chickadees seen on an observation day was four. I saw these species on about half the days I watched: on five of the days, no Black-capped Chickadees were observed, and on six of the days, no Chestnut-backed Chickadees were observed. The temperature on observation days fluctuated from 6° C to 20° C (from 43° F to 68° F). I calculated an average number of visits for each temperature category and created a bar graph to see if there were any trends in the data. See my graph.






CORNELL LAB OF ORNITHOLOGY **BirdSleuth: Investigating Evidence Resource Materials**

## JOURNAL PAGE 12

Name: \_\_\_\_\_
Date: \_\_\_\_\_



### BIRD Sleuth


## Plan and Conduct My Investigation

**How will I carry out my investigation?**  
To get started on your original investigation, devise a plan to carry out your work.

**Project Checklist and Timeline**

Use the checklist below to construct a timeline for each stage of your project. Remember to get your teacher's approval at each stage.

Project Checklist	Date to be Completed	Check When Done	Teacher Initials
a. Identify a researchable question related to birds, then develop a hypothesis that can be tested with the time and resources you have.		<input type="checkbox"/>	
b. Read about what you are studying for background, and summarize what you learn. Write down citation information for the resources you use.		<input type="checkbox"/>	
c. Outline your method, which may include designing an experiment, collecting data, accessing eBird, or gathering other information.		<input type="checkbox"/>	
d. Do your study, collecting any necessary data and information. You may need to make data sheets.		<input type="checkbox"/>	
e. Organize the data you collect in tables and graphs. Consider analyzing the data.		<input type="checkbox"/>	
f. Create a first draft of your scientific poster, presentation, and/or report.		<input type="checkbox"/>	
g. Go through a peer-review process and edit your work based on feedback.		<input type="checkbox"/>	
h. Communicate what you did and what you learned through a final scientific poster, scientific paper, oral presentation, and/or research report. Consider submitting your work to the Cornell Lab of Ornithology.		<input type="checkbox"/>	



CORNELL LAB OF ORNITHOLOGY **BirdSleuth: Investigating Evidence Investigator's Journal**



# Plan and Conduct My Investigation

<b>Scientific Report Components</b>	
<b>Section of report</b>	<b>What might be found in this section?</b>
<b><i>Introduction</i></b>	<ul style="list-style-type: none"><li>• Background information, including natural history information</li><li>• Statement of the hypothesis</li><li>• Why the question was chosen or is important to study</li></ul>
<b><i>Materials and Methods</i></b>	<ul style="list-style-type: none"><li>• Materials used to conduct the study</li><li>• Data details: when and where data were collected, who collected them, and how</li><li>• Any other methods used</li></ul>
<b><i>Results and Analysis</i></b>	<ul style="list-style-type: none"><li>• Results, including tables and graphs</li><li>• What the data or any patterns mean</li><li>• How the data were analyzed (if they were analyzed)</li></ul>
<b><i>Discussion and Conclusions</i></b>	<ul style="list-style-type: none"><li>• Conclusions</li><li>• Alternate explanations for the results</li><li>• Suggestions for improvements to the study design</li><li>• Ideas for future research</li></ul>
<b><i>References</i></b>	<ul style="list-style-type: none"><li>• Any citations: web sites, books, magazines, science reports, <i>Classroom BirdScope</i> or <i>BirdSleuth Reports</i> articles.</li></ul>



# Plan and Conduct My Investigation

Share your expectations for the student investigations and assign due dates for each of the above steps. See the **TEACHER TIP BOX**, (“How Can my Students Share Their Findings?” on page 28) for ideas and details.



Note that peer review and ways to share results (reports, posters, oral presentations, and articles) are covered in Investigation 5. You will want to cover that lesson before the deadlines that you’ve established approach.

## 4. Collect and analyze data and information.

- a. Ask students to complete a preliminary plan on **JOURNAL PAGES 13–15** (questions 1–8) with their project team or by themselves. Review their plans and make suggestions for improvement. If they are using a data sheet, ask them to submit a draft of the data sheet prior to collecting data. When their plans have been approved, invite them to begin their study.
- b. Provide each group with the time and resources they will need to conduct their investigations. As they progress, they should record their work on their data sheets and in their **JOURNAL (PAGE 16–17)**, questions 9–15. This journal can be used later to outline their poster/presentation/paper.

## JOURNAL PAGE 13


Name: \_\_\_\_\_ Date: \_\_\_\_\_

### Plan and Conduct My Investigation

Use the following pages to keep track of your research project. The left hand column will help you structure your work. As you conduct your project, use the right hand column to take notes.

#### Introduction

1. Write a question that can be answered using one of the methods you learned about.	1. My question: _____ _____
2. Develop a testable hypothesis to answer your question.	2. My hypothesis: _____ _____
3. Read about the topic you are studying (in books and on the Internet). Take notes in a notebook.	3. My list of references: _____ _____ _____ _____ _____

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## JOURNAL PAGE 14

Name: \_\_\_\_\_ Date: \_\_\_\_\_

### Plan and Conduct My Investigation

#### Materials and Methods

4. Describe how you will conduct your study.	4. My methods: _____ _____ _____
5. List the materials you will need.	5. My materials: _____ _____ _____
6. If you are doing an experiment, list the variables you'll consider.	6. My Independent Variables(s): _____ _____ My Dependent Variables(s): _____ _____ My controls: _____ _____

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# Plan and Conduct My Investigation



## **Teacher Tip**

### **HOW CAN MY STUDENTS SHARE THEIR FINDINGS?**

*We suggest the following ways to present findings, modeling what Cornell Lab of Ornithology scientists do. Of course, you may choose to do more than one of these options!*

#### **Classroom BirdWatch magazine, BirdSleuth Reports webzine**

*Invite students to look at the BirdSleuth Reports webzine, available on the BirdSleuth web site. You may also wish to order copies of past versions of the printed magazine (order forms are available on the BirdSleuth web site). We encourage students to submit many kinds of bird-related work. Make a list of possible submissions: science papers, research reports, graphs and charts, art, photographs, field sketches, and journals. Have students print and read the submission guidelines offered on the web site. Students should be sure their submissions are peer-reviewed and checked by a teacher prior to submission, and should understand that (as with any scientific publication) many works are submitted that cannot be included.*

#### **Class Newsletter**

*Compile the class submissions and publish your own BirdSleuth Newsletter, to be distributed in the school and at home. Encourage students to brainstorm what they might find interesting in a newsletter. Students can use their imaginations and creativity to come up with a design plan and/or look at other newsletters and magazines for ideas. Here are some additional ways students have showcased their knowledge about birds: poems, songs, short stories, book reviews, surveys, and interviews. Be sure to send a copy of your newsletter to the Education Department at the Cornell Lab of Ornithology!*

#### **Poster Session**

*Have students prepare a large poster to display their work for the class, school, or open house. Graphics and other visuals can be added to make the poster attractive. Due to their limited size, posters need to be succinct summaries (the font size must be large and readable and there may be several illustrations). Nevertheless, for a scientific poster, all sections (introduction, materials and methods, results and analysis, and conclusion) should be included. You may wish to have students write and submit summaries for one or more of the posters they examine during the poster session.*

#### **Ornithology Convention**

*Convene a conference during which students orally present their findings. You may wish to invite others to hear the presentation (the principal, next year's class, parents) and have the students prepare a PowerPoint presentation.*

