



Insect Pitfall Traps

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Description

This lesson will show the students that insects are present everywhere. No matter where your school is located, students can trap local insects on school grounds and then study them. They can also do simple investigations on different habitats and food sources used by various insects.



Student Outcomes/Objectives

- Students will be able to ask testable questions
- Students will use the inquiry cycle to investigate, gather data and interpret the results
- Students will be able to study the diversity of insects and other small organisms which live around the school; they can make an inventory / collection of insects in their school backyard



Standards

Benchmark 2

Identify the producers, consumers and decomposers in a given habitat
Describe the relationship between characteristics of species habitats and the organisms that live there

Benchmark 3

Identify populations of organism within an ecosystem by the function that they serve



Time Estimate

Four 50-minute class periods + time in class for writing/presenting report



Material (1 trap per pair of students)

DAY 1 Survey tape (to designate area for trap set up)

DAY 2 Small plastic containers -cups, margarine containers, etc. (1 per trap)

Small plastic/styrofoam bowls/lids (1 per trap)

Sharpie pens to decorate/identify each trap (1-2 per trap, different colors)

Pin flags (to locate traps next time go out)

Alcohol

Nails (larger, with grip, 3 per trap)

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This material is based upon work supported by the National Science Foundation under Grant No. 0139372

Trowels (1 per group of 4 students)

DAY 3 Cheesecloth (in 6" squares, 1/trap, to drain excess alcohol)
Small cups to drain off excess alcohol
Dissecting trays/small plastic, metal, styrofoam trays to sort insects
Popsicle sticks, to sort insects

DAY 4 Oregon Insect Boxes (4, from Oregon State University)
Insect field guides



Worksheets

DAY 1 Pitfall Trap Layout Design
DAY 4 Insect Order Dichotomous Keys
Pitfall Trap Collection and Classification Results
Pitfall Traps Experiment: Final Report Guidelines



Vocabulary

Pitfall trap: a mechanism for trapping insects which walk on the ground
Dichotomous key - an identification tool that uses paired statements to assist a person in learning the identity of an insect or other organism
Classification - a system of arranging objects / organisms into groups of the same

type



Background Information

- Students are familiar with the vocabulary in the simple Insect Order Dichotomous Key (either need to add into lesson, or have teacher introduce before Day 4)
- Students have understanding of how dichotomous keys work
- Students have had practice with basic classification



Lesson Plan

DAY 1 Develop Hypothesis/Procedures for Pitfall Traps (50-min period)
DAY 2 Put out Pitfall Traps (50-min period)
DAY 3 Collect Pitfall Traps (50-min period)
DAY 4 Classification of Insects (50-min period)



Extensions/Resources

<http://www.stclair.k12.il.us/services/scilit/pitfall.htm>
<http://bugclub.ifas.ufl.edu/Antivities/Pitfalltraps/pitfalltraps.htm>



Teacher Keys

N/A

<http://cropandsoil.oregonstate.edu/gk12>

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Teacher Worksheet



Develop Hypothesis/Procedures for Pitfall Traps

I. Introduction (5 minutes)

- *Today we will begin a longer project – pitfall traps - Show a sample pitfall trap – the container, the alcohol in the bottom, and the roof*
- *Pitfall traps are a sampling mechanism entomologists use to discover what kinds of insects are in a habitat*
- *What does this trap remind you of? What kind of organism uses a similar device to catch its food? (Ant lions)*
- *What kinds of insects do you expect to be caught in this type of trap? (Ground crawling)*
- *What kind of trap might you use to catch a flying insect?*
- *Why do we put alcohol in the bottom of the trap? (Kill insects, prevent predators from eating others)*
- *Why do we need some type of roof? (Prevents rain from overflowing trap)*

III. Scientific Inquiry Review (3 minutes)

- Ask students for the steps in the scientific method (write on board)
 - Question (Ask)
 - Investigate (Do)
 - Create (Learn)
 - Discuss (Write and Share)
 - Reflect (Think and Plan Again)
- *In this project, you will go through the entire inquiry process*
- *Today (Day 1) you will decide what your question is, generate a hypothesis, and develop your procedures*
- *Working in groups of four, each group will set out two traps (gives each team a chance to compare two sets of data)*
- *Day 2: make traps, set up on school grounds*
- *Day 3: bring traps in, separate out insects from debris/alcohol*
- *Day 4: Classify insects, record results*
- *Day 5 onwards: work on formal investigation write-up*

IV. Divide class into groups of four (2 minutes)

V. Brainstorming questions (5 minutes)

- *You will be surveying the insects on the school grounds. What kinds of questions might you ask about the insects and their relationships with each other and their habitat / environment?*
- Write student questions on whiteboard

VI. Writing hypothesis/prediction/procedures (30 minutes)

Write on the board:

1. Answer questions on front page of *Pitfall Trap Layout Design*
2. Pick a question (*either from those on board or a different question*)
3. Write a hypothesis (*given what you know about insects, what do you think you are going to see???*)
4. Make a prediction: If _____, then _____. (*If the hypothesis is correct, then what will you see that shows you the hypothesis is correct?*)
5. Develop your procedures


- *Work in your group, but each person write down the information on their own sheet*
- *Use questions on front page of worksheet to help you work out details*
- *Be specific with your procedure!*

VII. Wrap-up/What's Next (5 minutes)

- Have each group share their hypothesis and procedure
- Put sheet with hypothesis/procedure in safe place

Name: _____

Insect Pitfall Traps



DAY 1

Pitfall Trap Layout Design

Ask?

1. Where will you place your traps? (Check two, since your team will be putting out two traps.)

- _____ under a bush
- _____ under a small tree (seedling)
- _____ under a large tree
- _____ in the open grass
- _____ in the dry, sandy ground
- _____ other _____

2. Do you expect to find greater numbers of insects in one of the traps? Why or why not?

3. Do you expect to find different types of insects in each trap? Why or why not?

4. What question do you want to answer with this experiment? (What do you want to learn about insects around the school by setting out your traps?)

5. Make a hypothesis about the insects that you think you will find in each trap. The hypothesis should be your educated guess for the answer to your research question.

Hypothesis

6. Hypotheses (predictions) are often written as an “if, then” statement. Write your hypothesis below.

If _____,
Write your hypothesis here.

then _____.
What will you see in the traps if your hypothesis is correct?

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7. What is something you might see if your hypothesis is false?

Procedure:

1. What will your traps look like? (Draw and label or describe - materials, size, etc.)

2. How will you dig your hole? (What will you use, how big/deep will it be, etc.)

3. How will you set your traps? (Which part goes in the hole, what goes on top, etc.)

4. What will you put in your traps? (What keeps the insects from coming out, etc.)

5. How many days later will you check and collect your traps?

6. Write a specific procedure for putting the traps out and collecting them. Write the procedure as if you are giving instructions to someone who knows NOTHING about pitfall traps!

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DAY 2

Pitfall Trap Set-up

Pre-class Preparation

- Use survey tape to mark areas where each class will be setting up their traps, a different color of tape for each class

I. Introduction (2 minutes)

- On day 2 students will set-up pitfall traps on school grounds. Each group will pick two places to set up their 2 traps with or without baits in the trap.

II. Make traps (10 minutes)

1. Assemble into same groups as Tuesday
2. Each group is given the following supplies:
 - 2 cups
 - 2 sharpie pens
 - 2 plates/bowls
 - 6 nails
3. Students decorate bottom of plate/bowl with names, period number, etc.
4. Students Place 3 nails equidistance around edge of plate/bowl
5. Students write names and class period on cup

IV. Go over field procedures (3 minutes)

- Brainstorm possible/appropriate field procedures with the class (have students refer to their sheets from Day1).
- Write some version of the procedures on board:
 1. Locate sites to put traps (according to your procedures)
 2. Dig hole so that top of cup is level with ground
 3. Add about $\frac{1}{4}$ cup of rubbing alcohol (ask teacher for help)
 4. Place roof above trap
 5. Mark location with pin flag

IV. Put out traps (30 minutes)

- Bring class to area marked for that class
- Make sure students carry traps so that they do not lose nails while walking to site
- Hand out one trowel per team of four students
- Instruct each team put to set up two traps
- Teacher adds alcohol, ensures trap assembled correctly
- Once trap is finished, teacher gives students pin flag to mark location of trap

V. Wrap-up (5 minutes)

- Go over hypothesis – what students expect to happen
- Collect/count trowels while still in the field
- Return to class



DAY 3

Collect Pitfall Traps

I. Introduction (5 minutes)

- Collecting pitfall traps and do initial sorting/cleaning of collected organisms
- Locate your trap.
- Remove roof and pin flag, give to teacher.
- CAREFULLY carry cup with alcohol/insects back to classroom

II. Collect pitfall traps (20 minutes)

- Have students carefully remove traps from site
- Count pin flags to make sure all are returned
- Bring bag to collect bowls/nails of trap roof
- Have each team carefully carry their cups w/alcohol and insects back to classroom


III. Initial sorting/cleaning of insects (15 minutes)

- Have students work in same group as before
- Write main steps on board:
 1. Get supplies
 - One student acts as supplies manager and gets:
 - 2 squares of cheesecloth
 - 2 large plastic cups
 - 2 dissecting trays
 - 4 popsicle sticks
 2. Drain alcohol from cups
 - Carefully hold cheesecloth over pitfall trap cup
 - Tilt cup slowly and strain alcohol through cheesecloth into a large plastic cup
 3. Pour insects/debris into dissecting pan
 4. Rinse out pitfall trap cup at sink
 5. Separate insects from debris
 - use fingers, popsicle sticks
 6. Put insects back in pitfall trap cup

IV. Clean-up (10 minutes)

Write on board:

1. Dump alcohol in sink, rinse plastic cup and return to supplies table
2. Throw away debris in dissecting tray, rinse tray, return to supplies table
3. Throw away dirty cheesecloth and popsicle sticks
4. Carefully place cup with insects in the designated area for your class
5. Wipe off table with damp paper towel if necessary
6. Have each group share one insect they found



DAY 4

Classification of Insects

I. Introduction (5 minutes)

- Students will classify insects collected and record results
- Have several tools to classify insects
 - Insect Order Dichotomous key*
 - Oregon Insect Boxes
 - Insect field guides
- Record results on result sheet – in pencil!

II. Distribute supplies (5 minutes)

- 1 person/pair get insect cup
- 1 person gets other supplies:
 - 1 dissecting tray
 - 2 popsicle sticks
- Teacher hands out:
 - Field guides – 1 per table
 - Results sheet – 1 per student
 - Dichotomous keys – 1 per student

III. Classify insects/record results on results table (30 minutes)

- Carefully place insects in dissecting tray
- If there are a lot of insects, suggest splitting them up
- Utilize classification tools to identify insects/organisms
- Record results on results sheet
- Record results on master results sheet

IV. Clean-up (5 minutes)

- When finished, place insects gently back in cup, return cup to designated area
- Rinse dissecting tray, put on supplies table
- Throw away popsicle sticks

V. Go over report (5 minutes)

- Hand out report guidelines
- Briefly go over

Post-class Prep:

- Have students record data collected by other teams on results sheet for report (or make copy of master sheet, hand out)



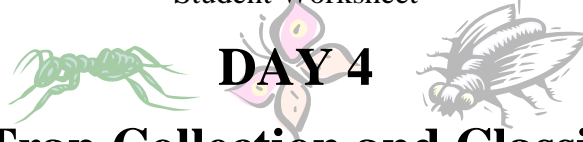
DAY 4

Insect Order Dichotomous Key

<u>Scientific Name</u>	<u>Common Name</u>
Anoplura	sucking lice
Coleoptera	beetles
Collembola	springtails
Dermaptera	earwigs
Diptera	flies
Ephemeroptera	mayflies
Hemiptera	true bugs
Homoptera	aphids, cicadas and hoppers
Hymenoptera	ants, bees and wasps
Isoptera	termites
Lepidoptera	butterflies and moths
Mallophaga	chewing lice
Mecoptera	scorpionflies
Neuroptera	dobsonflies, fishflies, alderflies, lacewings, ant lions
Odonata	dragonflies and damselflies
Orthoptera	grasshoppers, katydids and crickets
Plecoptera	stoneflies
Psocoptera	booklice and barklice
Siphonaptera	fleas
Thysanoptera	thrips
Thysanura	bristletails
Trichoptera	caddisflies

Name: _____

Student Worksheet



DAY 4

Pitfall Trap Collection and Classification

What did you find in your trap?

Scientific Name (Order)	Common Name (Optional)	Number Found	Insect or Non-Insect ?
	Beetle		
	Potato Bug		
	Spider		Non-insect
	Non-keyable insects		

Total Insects: _____

Total Non-Insects: _____

Draw an insect collected in your trap. You may use a dissecting microscope.

What did your partners find in their trap?

Scientific Name (Order)	Common Name (Optional)	Number Found	Insect or Non-Insect ?
	Beetle		
	Potato Bug		
	Spider		Non-insect
	Non-keyable insects		

Total Insects: _____

Total Non-Insects: _____

Draw one of the insects collected in your partners' trap. You may use a dissecting microscope.

Experiment Follow-up

1. Answer your research question.
2. Was your hypothesis right? Explain how you know.
3. What was one thing that you collected (or did not collect) that surprised you?
4. If you were to do this experiment again, knowing what you now know, what would you do differently?
5. Is there any part of the experiment that you feel that you could do better? What? How?



DAY 4

Pitfall Traps Experiment: Final Report Guidelines

Your pitfall trap report will need the following sections. Much of the information is already on your experiment design sheet and your results sheet. Be creative! Make your report as nice-looking as possible!



1. Cover page/title

- separate page
- title (should tell reader something about your experiment)
- your name
- your teacher's name
- your period number
- any drawings/decoration you want to add (can be in color)

2. Table of Contents

- list each section of your report and what page it is on



3. Materials and Supplies section

- Write heading "Materials and Supplies" at beginning of this section
- Record materials used by your team for your experiment
- Below is a sample list of materials and supplies needed for this experiment

2 plastic party cups
2 foam bowls
6 3-inch nails
1 trowel
2 pin flags
½ cup rubbing alcohol
2 dissecting trays
8 popsicle sticks
1 6-inch square of cheesecloth
2 large plastic cups
insect dichotomous key

4. Research Question section

- Write heading
- Write the question that you were trying to answer with your experiment



5. Hypothesis section

- Write heading
- Write down your hypothesis

6. Prediction section

- Write heading
- Write down your prediction

7. Procedures section

- Write heading
- Write procedures, numbering each step



8. Results section

- Write heading
- Make data table and record your results (can use results worksheet as a guideline)
- Draw pictures of organisms captured in trap

9. Discussion section

- Write heading
- Discuss results
- Make sure you answer the following questions in this section (in paragraph format)

How many total organisms did you catch in each trap?

How many types of organisms did you catch in each trap?

Which type of insect was the most common (had the most individuals)?

Which type of insect was the least common (had the fewest individuals)?

Each insect caught made up what percentage of the total insects?

Was there a difference between the insects in the two traps?

Where was each trap placed – what type of environment?

10. Conclusion section

- Write heading
- Answer the following questions, in paragraph format

Did your results support or falsify your hypothesis? Why?

What might be some errors in your experiment?

Would you change your procedures if you did this experiment again? would you change?

If we had time to continue doing pitfall traps, what would be the next research question that you would investigate?

