What do I have here? How do I know? So what?
Insect observation, identification, recording, analyzing, and drawing conclusions

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Level – Intermediate: Appropriate for grades 4-6, but adaptable lower or higher

Standards: Environment and Ecology 4.5.4 A, B, C
Science and Technology 3.2.7 D; 3.3.7 A, D
Reading, Writing, Speaking, and Listening 1.2.5 A; 1.8.5 B

Objectives:
Demonstrate an understanding of ability to observe, record, analyze, and draw conclusions about a specimen.
Use research materials to identify specimen.
Make predictions, decisions, and/or recommendations based on data gathered.
Consider bias in data collection.

Background:
Insects are very plentiful in the late summer when school begins. Chances are that students will bring in "bugs" in a jar, talk about being stung or bitten, seeing things flying around, etc. without too much prodding. Monarch butterfly caterpillars are also collectible (if you have fields around your school or home and if milkweed is present). The Monarch makes a wonderful life cycle study because students can observe the entire life cycle in about three weeks to a month, then butterflies can be released (tagged first if you care to be part of Monarch Watch) without interfering with their life cycle.

Materials: A small plastic vile with a snap top for each child, research materials on insects, spiders and mites, and snails and slugs, hand lenses, microscopes if available, pencil and paper, alcohol and cotton balls (if you have a "critter" that survives the trip to school).

Time: Minimum of four class periods - could turn into an entire unit if you choose to delve into the IPM methods and social consequences.

Day 1- Ask students what a pest is. (PA Standards definition- "A label applied to an organism when it is in competition with humans for some resource.") Students should come to an understanding that a "pest" is a human label. Allow discussion and settle on any working definition that meets the basics of the PA Standards def. Do not expect elementary students to use the formalized one-they will work better with one that is in their own words. (15 min.) Brainstorm a list of pests (5-10 min.) Give each student a small plastic vile and tell them that each of them is to bring a pest which will fit in that vile with lots of space around it. Allow for questions and discussion of safety and care. Somewhere along the way, make the point that the specimen needs to be captured carefully so that it is not "smooshed beyond recognition" because the "pest" is going to be observed, drawn, and researched tomorrow. (about 15 min.) Ask students to describe the time of day that they caught this "pest", the area that it was in (inside or

outside, yard, field, garage, etc..), the conditions of the area (dark or light, damp or dry, plants, in on or under something, etc.

Day 2- (45 minute period or longer depending on the amount of detail and interest are shown) Discuss what information is important to record. Make a record of all suggestions on the board or overhead. Size, color, # of feet, wings, body parts, sound, activity, antennae, mouth parts are all suggestions for observation, drawing, and recording. Choose the categories to be identified and give out the record sheet or design one to suit your needs. (worksheet follows plan) If specimen is still alive, alcohol on a cotton ball can be put in the vile to kill the "pest". Distribute the hand lenses, plain white paper (or black if the pest happens to be a cabbage moth or other white or very light colored "critter"). Students should then take data about each of the characteristics assigned and draw a scientific drawing of their "pest".

Start the class period with a discussion of the difference between a scientific drawing and a creative drawing. The purpose of the scientific drawing is to record true data as accurately as possible, while the creative drawing can have a variety of purposes, but does not represent a real object. (I usually do a lesson on this topic beforehand with a simpler object-leaves work well-they stay put, have a simpler outline, fewer parts (veins and possible texture. They do, on the other hand offer a chance to collect and record data on size, color, etc.) Once the assignment is clear and work has begun, teacher's job becomes one of directing, observing, and encouraging-praise works well! At the end of the period, "pests" should be returned to the viles and collected for use again the next day. If students do not have a notebook or folder to keep observation forms, they may be collected, but they will be necessary in later lessons, so they should be kept and brought to class the next day.

Day 3- (45 minute period) Return viles and look at yesterday's observation sheet. Have students use a microscope to take a closer look at the "pest". Two students to a microscope works well and will give them time to critique each other's recorded data with the purpose of making all data more accurate. Once the work is well under way (15 or 20 min.), ask if the microscope helped see any new characteristics. The addition of mouth parts and/or antennae, details of leg and body parts should be made to the data sheet. The idea of other drawings of individual parts to show the newly discovered details should be added to the original worksheet. The information about where the specimen was collected and the conditions should also be added to the observation worksheet. At the end of class, assign a one week log of pests around their home or yard to be kept and returned (if this portion of the plan is followed, it will lead to data which can be compiled into graphs or charts to show the types and frequency of certain types of pests. It should also be accompanied with a discussion of the bias in such data-time of day, season of the year, conditions that were observed-what else do students think is out there that they might have missed? Underground, nocturnally active, quick, tiny, etc. Graphs should be labeled Pests we observed in---a location or a time, etc. Common is a good word to add to that title-giving the understanding that data is only part of the whole.) All worksheets and viles with specimens should be kept for use on the next day.

Day 4- Identification of specimen. Viles, drawings and data sheets will be used to find and identify the specimen. Research materials, Golden Book Guides, library books, encyclopedia, the Internet are all sources for information which will lead to ID, hopefully. Students may work

in small groups or individually. Once the ID has been made, more information about the specimen may be added to records, or the proper name may just be added to the top (title of the worksheet). These observation sheets could be collected and graded using a rubric.

Holistic Rubric

Advanced-All information collected and displayed clearly and accurately. All labels are correct and easy to read. Additional parts drawn and labeled correctly and clearly.
Proficient-information required is clearly recorded and accurately displayed.
Partially Proficient-Some of the information required appears and is labeled. Understanding of purpose is shown in work, but has not been accomplished completely.
Novice-Partial or unclear drawing with no, or inaccurate, data recorded. Incomplete work.

If time remains in this class period, a discussion of the frequency of pests found could lead to statistical representation of Class Results (pie chart, graph, etc.). The discussion of bias would also be appropriate here. What would happen if we all went out at 8 PM or 6 AM? What if we all picked up the outside garbage can? What if we all dug a hole? Would we find the same things in the park or field that we find in our own backyard? What would we find in our attics, our trees, our gardens? You get the idea!

If the idea of the log has been used, the data will also need to be compiled and displayed at the end of a week. Further studies might be conducted at the school site. If this is done, discussion of IPM at school would be very appropriate. Having a maintenance person come and discuss IPM with him/her could be an extension. Note-prepare the maintenance person ahead of time to alleviate the adversarial connotations-develop a partnership! Your class could be an asset to this staff if the connection is carefully made. Real life data and purpose are good teaching tools and definitely reinforce learning.

Literature Connections: If cockroaches become a topic of discussion, Shoebag by Mary James is a good fictional book about a cockroach who becomes a boy. Reading level 4.
Jean Craighead George writes wonderful ecomysteries which would extend a unit like this. The Firebug Connection is about the disruption of an insect life cycle caused by the ink on the newspaper in their box. Who Really Killed Cock Robin is about the fertilizers used by homeowners and their effect on birds. These books are written on a 5th grade level.

Observation Data Sheet

_____
(name of pest)

Color-_____

Size-_____

# of Legs_____

# of Wings_____

#of Body Parts_____

Antennae_____

Scientific Drawing_____