

ECOS Inquiry Template

1. **Contributor's Name:** Jen Marangelo

2. **Name of Inquiry:** Is that an insect?

3. **Goals and Objectives:**

a. **Inquiry Questions:**

What physical characteristics do you look for to identify an animal as an insect?
What is one physical characteristic that you look at to identify different insect orders?

b. **Ecological Theme(s):** Observation, Description, Characteristics of insects

c. **General Goal:**

Give students the opportunity to look closely at some local insects.
Teach students to identify an animal as an insect.
Point out a characteristic that students should look at if they want to identify an insect to order.

d. **Specific Objectives:**

Students will learn why insects are important to humans.
Students will recognize the diversity of insect morphology and behavior.
Students will develop observational skills.
Students will identify the two characteristics all insects have in common.
Students will learn relevant terminology.
Students will become familiar with 3 local insects.
Students will learn about one characteristic to note if they'd like to identify an insect to order.

e. **Grade Level:** K - third grade

f. **Duration/Time Required:**

- **Prep time** – prepare/borrow pinned insects
- **Implementing Exercise During Class** – 1 hour 15 minutes
- **Assessment** – takes place during activity plus time to review journals

4. **Ecological and Science Context:**

a. **Background (for Teachers):**

Insects are by far the most successful organisms on this planet. They account for 80% of all animals on earth, dominate every ecosystem except the ocean, display a diverse array of morphology and behavior, and play a vital role in the lives of every living creature on earth. They provide essential products and services such as honey and pollination and are an important food source for animals, including people. In short, our society could not exist without insects.

So who are the insects? Insects are a class of organisms in the kingdom Animalia and the phylum Arthropoda. All arthropods (which include insects, spiders, millipedes, centipedes and crustaceans) have an exoskeleton, a segmented body and jointed limbs. All insects have three body parts (head, thorax and abdomen) and 3 pairs of legs. The head of an insect has the one pair of antennae (sensory organ), compound eyes, up to three simple eyes and mouthparts. The thorax is the point of attachment for all 6 legs and the wings.

There are differences of opinion amongst taxonomists regarding the number of insect orders but there are approximately 25-31 orders of insects. These are distinguished by their wings, mouthparts and metamorphosis. Adult insects may have 0, 1 or 2 pairs of wings and may be modified in a variety of ways unique to their

order. When identifying an insect to order it's easiest to look at the wings. When working with your students on how to distinguish between common insect orders, use the following guidelines. With older students it may be interesting to introduce the scientific name and translation to help them remember the characteristics of the animal.

Insect (Scientific name – meaning)	Number of Pairs of Wings	Description of Wings
Beetles (Coleoptera – sheath wing)	2	Front wings (elytra) are hard and leathery and meet in a straight line down the middle of the back. Hind wings are membranous and fold underneath front wings.
Ants, Bees and Wasps (Hymenoptera – membrane wing)	0-2	If there are wings, both pairs are membranous with few veins. The front wings are larger than the hind wings.
Flies and Mosquitoes (Diptera – two wings)	1	One pair of membranous wings. Hind wings are reduced to halteres which sometimes look like a short stick with a ball at the end and are thought to stabilize the body during flight.
Butterflies and Moths (Lepidoptera – scale wing)	2	Adults have 4 large wings covered with scales. The front wings are usually triangular and hindwings more oval.
True Bugs (Heteroptera – half wings)	2	The part of the front wing closest to the thorax is thickened and the rest is membranous. The hind wings are all membranous. At rest, the wings are held flat over the abdomen with the membranous tips overlapping. Abdomen looks like it has 3 triangles and a diamond shape on it (roughly).
Grasshoppers and Crickets (Orthoptera – straight wing)	0-2	The front wings are thickened and many-veined and hind wings are membranous. Hind wings fold fanlike underneath front wings when not in use.
Dragonflies and Damselflies (Odonata – tooth)	2	Wings are long, narrow and both are membranous.

b. Background (to present to Students):

See methods/procedures.

5. Motivation and Incentive for Learning: This is an opportunity for student to look closely at some local insects.

6. Vocabulary

Abdomen – the rear portion of an insect’s body

Antennae – sensory organs on an insect’s head

Elytra - the hardened front wing of a beetle

Exoskeleton – a hard external skeleton

Thorax – the middle part of an insect’s body; the wings and legs are connected to this part of the body

7. Safety Information: N/A

8. Materials List (including any handouts or transparency masters):

Student journals or paper

Writing/drawing utensils

Rulers (optional)

Magnifying glasses (optional)

Large picture or 3-D model of an insect – need something that the whole class can see at one time

A box of 3 pinned insects for every four students – best to use three different orders with distinct wing types (example – beetle, true bug and a bee). Also try to give each group of students the same types of insects. This helps with the discussion and keeps kids from wanting to look at another group’s insects.

9. Methods/Procedure for students:

a. Pre-investigation work:

Begin by asking students why we should care about insects. Possible responses include:

There are a lot of them. Insects account for 80% of all animals.

They are found everywhere (except the open ocean) and are an important part of ecosystems.

They are an important food source for other animals (including humans!)

They provide us with fruit and vegetables by pollinating plants.

Insects provide us with products like honey, silk and shellac.

Some eat less desirable insects (example – dragonflies eat mosquitoes).

Some are vectors for disease.

Insects decompose leaf litter, wood, carrion and dung.

They are cool!

Then ask students to name some insects and list them on the board. Choose one or two and ask students to describe how the insect looks and what it is usually doing when they see it. Point out that insects are a huge group of animals that can look and behave very differently but all insects have a few physical characteristics in common.

b. Investigation work:

1) What evidence (data, samples) do students collect?

Give 1 box of 3 pinned insects to every 3 or 4 students. Ask them to look closely at the insects and draw pictures of them. Ask them to look at shapes and count parts on the animal. Tell them not to care how good the drawings are but just record what they are seeing. If there is something they can’t draw they can use words to describe the characteristic.

2) How do students present the evidence (data)?

After students have drawn the insects, ask them what they have in common. They may or may not notice that all have 3 body parts but they will probably see 6 legs, wings and antennae. Use a large picture or 3-D insect to point out the different body parts, function and correct terminology. Point out that the insects in their box may have all of the characteristics mentioned but there are some insects that don't have wings. Ask if they can think one (ants). Then tell them that the two characteristics all insects have are 3 body parts and 6 legs.

Point out that wings are very important for insects and wing type is one way to tell the difference between groups (orders) of insects. Use the insects in the student's boxes to talk about different wing types and how to distinguish between the three orders of insects in their box.

Ask students how they will know if an animal is an insect or not. Ask what characteristic they should look at if they want to identify what type of insect it is.

Finish with a game of "Simon says" where the students are insects and they are told to touch their head, thorax (chest) or abdomen (stomach) or show antennae (two fingers on top of head), wings (flap arms) or six legs (hold three fingers on each side of their body). This will help students remember some of the new terminology.

10. Assessment: Assessment can be done by looking at the student's journals and monitoring the class discussion.

11. Extension Ideas:

Insect safari – Look for insects in the schoolyard and do sketches of those paying close attention to the wings.

Have students research different orders and present to the class.

12. Scalability:

Can make more difficult by doing with insect orders – have students try to figure out what each order of insect have in common (wing type).

13. National Science Standards Accomplished:

Characteristics of organisms

Organisms and environments

14. References:

15. List of Experts and Consultants: Contact local entomologist/extension service to obtain pinned insects.

16. Evaluation/Reflection by Fellows and Teachers of how it went:

This inquiry went really well with a third grade class with just a little background knowledge about insects. I think it was important that students in this age group only looked at 3 insects – more would have been overwhelming. I didn't have time to play the Simon says game in the hour given for this inquiry.