insect investigation

teacher's guide

University of Nebraska State Museum

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Insect Investigations Encounter Kit, 1992.
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University of Nebraska Lincoln

Dear Colleague,

The Insect Investigations Encounter Kit is designed to bring hands-on materials and inquiry based activities from the University of Nebraska State Museum to the classroom. We hope this kit will enable students to appreciate the varied and interesting world of insects.

The objectives of this Encounter Kit are for students to:

1. discover what an insect is by looking at different types of insect features;

2. learn that insects are the most diverse group of organisms in the world and be able to identify eight common insect orders;

3. experiment with camouflage and mimicry as defense mechanisms;

4. understand why insects have such an immense biological success and learn to estimate numbers which are too high to count;

5. use their observation skills to find traces of insects at any time of the year.

The activities range in length from 50 to 60 minutes. Any class size is possible, but groups of under 30 students are recommended. Students should have a comfortable amount of space for viewing or working with materials. These activities are designed for use either outdoors (optimal) or indoors - depending on the weather and your classroom design.

Your input into the usefulness, effectiveness, and enjoyment of this kit is valuable. Please assist the University of Nebraska Lincoln in insuring that our goals and objectives are met by completing the enclosed Evaluation Form. Your opinions are most important!

We hope that you and your students enjoy learning about the rich diversity of insects. If you have any questions feel free to call (402) 472-6302.

The University of Nebraska State Museum Education Staff

Table of Contents

Encounter Kits

Encounter Kits are organized around a teaching-learning framework, which guides teaching and learning through four main stages.

STARTING OUT:

Usually a full group discussion. This provides an opportunity for you to stimulate curiosity, set challenges, and raise questions. Students share their knowledge and previous experience on the topic.

Teacher:

- Probes for current knowledge and understanding
- Motivates and stimulates activity
- Sets challenges and poses problems

Student:

- Shares thoughts and ideas
- Raises questions

ACTIONS:

Groups of students look closely at the phenomena or actively participate in actual scientific work. They work directly with materials. It is important to allow enough time for this inquiry stage, so that they can explore materials and concepts that are new and fully experience trial and error. This can be an investigation time as students discuss ideas together, try out activities and manipulate materials.

Teacher:

- Facilitates
- Observes

Student:

- Explores
- Observes
- Works as a team member
- Problem solves
- Records

TYING IT ALL TOGETHER:

Usually a full group experience, this stage provides students with the opportunity to share their discoveries and experiences. You guide them as they clarify and organize their thinking, compare their different solutions, analyze and interpret results, and attempt to explain the phenomena they have experienced.

Teacher:

- Questions
- Guides
- Assesses student understanding

Student:

- Interprets and analyzes
- Synthesizes
- Communicates
- Questions

BRANCHING OUT:

This optional stage allows the students to connect and relate learning from the kit activity into other projects and activities.

Teacher:

- Facilitates
- Assesses understanding

Student:

- Applies
- Questions
- Integrates

Contents of the Insect Investigation Kit

Activity 1: Insect Adaptations

- 10 Kaleidoscope lenses
- 5 Boxes with insect specimens
- 30 Plastic insect models
- 20 Magnifying lenses
- 1 Insect leg adaptation plasmo-mount
- 1 Honey bee head plasmo-mount
- 1 Grasshopper head and mouthparts plasmo-mount
- 1 *NatureScope - Incredible Insects*
- 1 Insect Legs and Insect Mouths - Template
- 4 Insect Posters

Activity 2: Insect Diversity

- 5 June bugs - *Coleoptera*
- 5 Paper wasps - *Hymenoptera*
- 5 OBIS Activity - *Lawn Guide*
- 1 OBIS Activity - *Animal Diversity*
- 1 Reading Rainbow Video Tape - *Bugs*
- 1 *4-H Entomology Manual*
- 1 Insect Order Plasmo-mount

Activity 3: Invent an Insect

- 1 OBIS Activity - *Invent an Animal*
- 2 Insect Specimens:
  - 1 Morpho Butterfly
  - 1 Monarch Butterfly

Activity 4: How many can there BEE?

- 1 Vial of plastic ants
- 1 OBIS Activity - *Bean Bugs*

Activity 5: Snug as a Bug

- 5 Bagworm homes
- 5 Paper wasp's nests
- 1 OBIS Activity - *Snug as a Bug*
- 1 Large paper wasp nest

Additional Resources

- 1 *Eyewitness Books: Insect*
- Poster - *Ant Anatomy*
- Museum Notes: *Nebraska Salt Marsh Tigers*

Oversized Materials

- 4 Insect Posters
  - Dragonflies
  - Bees, Wasps, & Ants
  - Bugs
  - Beetles

Insect Investigation Kit References

Borror, D. & R.E. White. 1970. *A Field Guide to the Insects of America North of Mexico.* Peterson Field Guide Series.

Lawrence Hall of Science. 1980. *Outdoor Biology Instructional Strategies.* Delta Education, Nashua, New Hampshire.

Ranger Rick. 1988. *NatureScope - Incredible Insects.* National Wildlife Federation, Washington, D.C.

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Suzuki, David. 1991. *Looking at Insects.* Wiley & Sons, N.Y.

Activity One – Insect Adaptations

Learning Objective:
Students explore different types of insect features.

Activity One – Insect Adaptations

Group size:
Divide students into five groups

Time:
Two 30 minute sessions or one long session

Materials Provided:

- 10 Kaleidoscope lenses
- 5 Boxes with insect specimens
- 30 Plastic insect models
- 20 Magnifying lenses
- 1 Insect leg adaptation plasmo-mount
- 1 Honey bee head plasmo-mount
- 1 Grasshopper head and mouthparts plasmo-mount
- 1 *NatureScope - Incredible Insects*
- 1 Insect Legs and Insect Mouths - Template
- 4 Insect Posters (also for use in Insect Diversity Activity)

Additional Materials Provided:

- *Eyewitness Books: Insect*

Additional Supplies Needed:

- Aluminum foil
- Construction paper
- 6" Paper plates
- Glue stick or scotch tape
- Pipe cleaners (optional)
- Miscellaneous classroom materials - students can be innovative
- Straws
- Duct tape
- Scissors
- Pliers
- Small sponges

Preparation:

- Make copies of Insect Legs and Insect Mouths (one for each student.)
- Set up five stations around the classroom where groups can work with a set of plastic and real insect models. Set out at each station:
  - 6 Insect plastic models
  - 1 Box of insect specimens
  - 2 Kaleidoscopes (eyes)
  - 2 6" Paper plates (eyes)
  - Duct tape (feet)
  - Straws (mouth)
  - Sponge (mouth)
  - Pliers (mouth)
  - Construction paper (wings and legs)
  - Scissors
  - Scotch tape or glue
  - Aluminum foil (antennae)
  - Pipe cleaners (antennae)
  - 4 Magnifying lenses (or more if you have them available. It would be nice if each student had one to use.)
  - Insect Legs and Insect Mouths copies
- Display the 4 insect posters in a visible place.

Activity 1

Background:

Insects come in a wide variety of shapes and sizes. All adult insects have six legs and three distinct body parts. Most adult insects have two antennae and one or two pairs of wings. Not all insects have wings.

In contrast to this are spiders, ticks, and scorpions which may resemble insects but are not. Spiders have 8 legs and two body sections.

Insects' three body parts are called the head, thorax and abdomen. Located on an insect's head are its eyes, antennae and mouth parts. The thorax, or mid part of the insect, is where the three pairs of jointed legs are attached. Also attached to the thorax are the wings, if they exist. The third body part, the abdomen, contains the digestive, reproductive and breathing organs.

Insects have adapted to, and can be found in, almost every habitat in the world. The adaptations of insects are directly related to how they find food and survive.

By looking at an insect's head and legs we can learn where an insect might live and what or how it might eat. What and how an insect eats is dependent on what type of mouth it has. Insects, like grasshoppers, use their mouths for chewing, cutting or tearing and have powerful jaws that move sideways – not up and down like human jaws.

Some insect jaws are so powerful they can bite through a thin sheet of lead and copper. Some insects, like butterflies and moths, have mouth parts that are especially suited for sucking (straws). Their mouth parts are shaped like a long tube which they use to suck up liquids, like nectar, from flowers. Other insects, like flies, have mouth parts that end in a broad sponge-like tip that they use for soaking up liquids. One last type of insect mouth acts like a hypodermic needle, piercing the skin of a plant or animal and sucking out the liquid inside. Examples of this are stink bugs (plant juices) and mosquitoes (animal blood).

Insects have two different types of eyes that they use to see the world. The two types of eyes are called *simple* and *compound* eyes. Compound eyes are made up of thousands of tiny lenses. With thousands of lenses, insects see very differently than we do. With each lens pointing at a slightly different angle, an insect is seeing in many different directions at once. Just try to imagine seeing in thousands of directions at one time. The kaleidoscopes ("bug eye" lenses) that are included as a part of this activity are the closest we can come to showing what insect vision might be like. Simple eyes are thought to detect only differences in light or dark.

Insects' antennae are used for sensory reception. Most adult insects have antennae. Antennae differ in size and shape. They tend to be smaller in insects having very good eyesight, as in Dragonflies. The larger and more elaborate the antennae are, the more sensory information that can be gained from the environment. The sensations the antennae perceive are primarily odors. Vibrations can also be picked up. These vibrations may be caused by sound or movement.

An insect's legs, like its mouth parts, are adapted to its lifestyle. For instance, many of the swimming insects have long, flat, oar-like hind legs. Grasshoppers and other jumping insects have long, muscular hind legs adapted for jumping. Some other insect leg adaptations are those of the honeybee, whose hind legs have a pollen carrying "basket"; the butterflies, whose front legs are adapted as eye cleaning brushes; and flies and bees who have hooks and sticky pads on their feet which allow them to walk on slippery surfaces, walls and ceilings.

See pp. 12 - 21 in *Eyewitness Books: Insect* for more info.

Starting Out or First 30 Minute Session:

1. On the blackboard write the word **Insects**. Draw two lines from Insects and write **Different** for one column and **Alike** for the other.
2. Show the students the 4 insect posters.
3. Ask the students the following questions and place their answers in the appropriate column.
   In what ways are all insects the same? (jointed legs, etc.)
   How many parts to its body does every insect have? (3)
   How many legs does an insect have? (6)
   In what ways are insects different from each other? (size, wings, legs, mouthparts, antennae, etc.)
4. Divide the students into 5 groups and ask them to go to the stations.
5. Ask the following questions while they examine the real and plastic insect models. Remind them to handle the real insect specimens with care because they are fragile and also tell them that the plastic insects are not completely true to size or accurate in their features.
6. Which of the insects that you are looking at. . .
   - has a mouth part that might act like a straw?
   - has a mouth part that might act like a sponge?
   - has a chewing mouth part?
   - has a needle-like mouth part?
   - has jumping legs?
   - has sticky pads on its feet?
   - has fringed antennae?
7. How are insects' eyes different from our eyes?
8. Point out to them the compound eye on the dragonfly poster.
9. Using the magnifying lenses, have them try to see the compound eyes on the insect specimens.
10. This is a good place to stop if you want to make this activity into two sessions. Tell the students to think about what kind of insect they would like to design. Place the three plasmo-mounts (honeybee, grasshopper, leg adaptations), the Eyewitness Insect Book, and any articles or books you have available in an independent area for them to examine when they have free time.
11. Give them some time to examine the specimens and, if desired, to research their insect in the library or at home.

Action or Second 30 Minute Session:

(Make sure that all the materials are available in their work area for them to use.)

1. Tell the students that the materials in front of them are for them to use to make themselves into an insect (the models and specimens are exceptions to this). They can also use any other object in the classroom that they need to meet their objectives.
2. Let them discuss what kind of an insect they would like to be.
3. Have them design their insect parts. They can work together to put their parts on. They will need to share some of the items. If they want to be a three-segmented insect, they might want to work in groups of three. (Remind them that insects have their legs on the middle part of their body - the thorax.)
4. When they are finished with their own costume, ask for volunteers to stand up and show the rest of the class their design. Have them describe what kind of mouth part, feet, and eyes they have.
5. Ask for 5 volunteers who are using the compound eye kaleidoscopes. Have them try to walk a straight line. Have them pass the eyes to other volunteers. Have them try to turn their heads to see things close up. Have them pass the eyes to other volunteers. Have them turn their heads to see things farther away. Continue in this manner until everyone has a chance.

Tying It All Together:

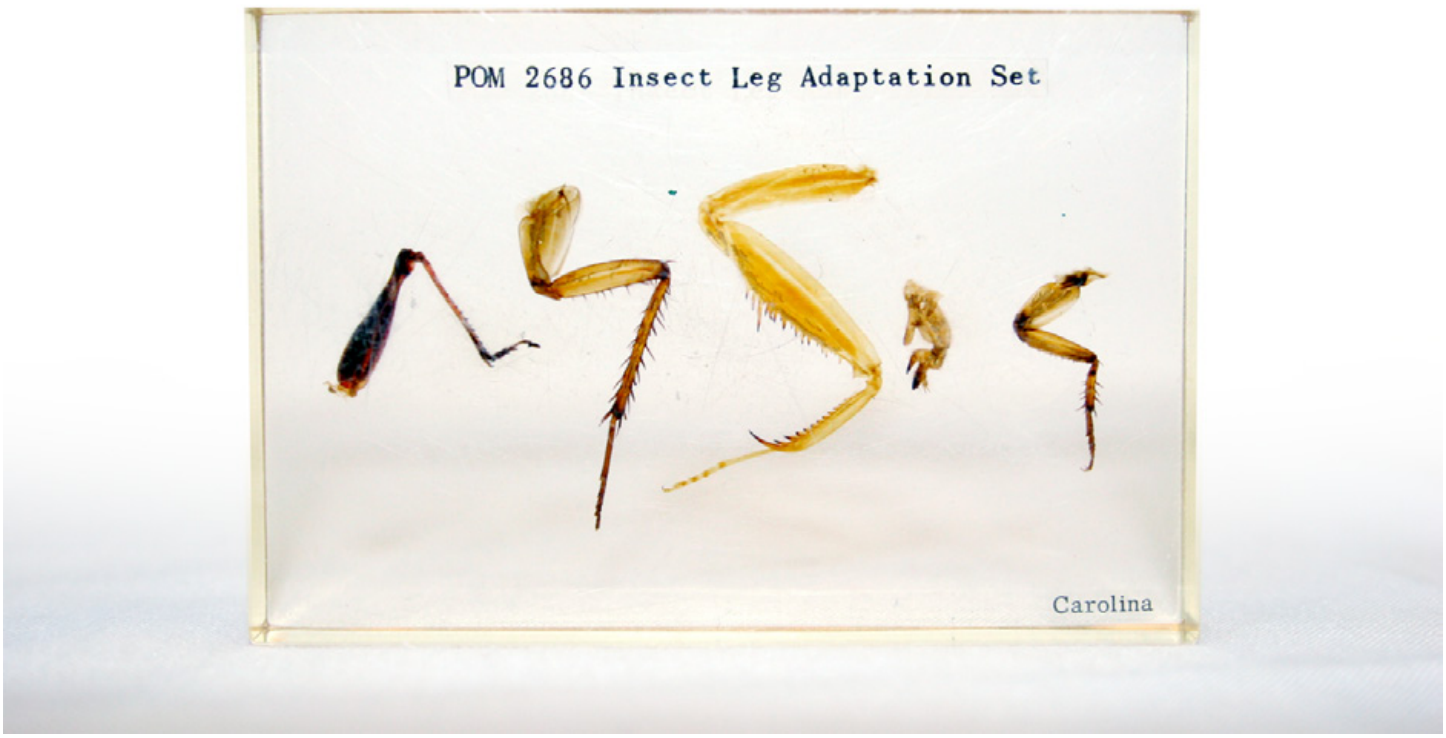
Ask the students the following questions:

- If you were an insect that had a straw-like mouth, what would you eat?
- If you were an insect that had chewing mouth parts, what would you eat?
- If you had sponge-like mouth parts, what would you eat?
- If you had a needle-like mouth part, what would you eat?
- What would be the advantage of having sticky pads on your feet?
- What would be the advantage of having jumping legs?

Branching Out:

Do the following activities from NatureScope's Incredible Insects:

- Do the following activities from NatureScope's *Incredible Insects*:
  Observe an Insect, p. 10 - 11
  Eight Legs or Six, p. 11 - 12
- Visit another class and show them your costumes. Have the students describe themselves.



Activity Two – Insect Diversity

Learning Objective:
Students discover the many different kinds of insects and identify the eight common insect orders.

Photos by Daniel Andres Forero (dragonfly), weatherbox (cicada), kliverap (grasshopper), Simon Cataudo (wasp), Andrzej Pobiedziński (butterfly), Remigiusz Szczerbak (fly), Craig Jewell (beetle), and Gustavo Bueso Padgett (bug)/stock.xchng

Activity Two – Insect Diversity

Group size:
Any, although a class size of 16 is optimal.
Students will work with a partner

Time:
50 minutes

Materials Provided:

- 5 June bugs - *Coleoptera*
- 5 Paper wasps - *Hymenoptera*
- 5 OBIS Activity - *Lawn Guide*
- 20 Magnifying lenses *For use in all activities.*
- 4 Insect Posters (also for use in Insect Adaptation Activity)
- OBIS Activity - *Animal Diversity*
- Reading Rainbow Video Tape - *Bugs*
- 1 *4-H Entomology Manual*
- 1 Insect Order Plasmo-mount

Additional Materials Provided:

- *Eyewitness Books: Insect*

Additional Materials Needed:

- See OBIS Activity Card for materials necessary for activity.

Preparation:

- Follow instructions in OBIS Activity - *Animal Diversity*

Background:

Scientists group closely related species into genera, genera into families, and families into orders. There are 31 orders of insects, but most of the common insects fall into one of 8 orders. By knowing these orders, how to identify them, and some of their life habits, students will be able to appreciate how diverse insects are and will have a better understanding about what they see when they are outdoors.

Order: Hymenoptera Means membrane-winged. This order includes bees, wasps and ants. These insects have two pairs of thin, membranous wings and, in the females, the abdomen ends in an egg-laying organ or stinger. Ants are in this group because they have wings at certain stages during their life cycles and many have stingers.

Order: Diptera Means two wings. This order includes flies, mosquitoes, and gnats. These insects have only one pair of wings.

Order: Lepidoptera Means scaly wings. This order includes moths and butterflies. Their two pairs of wings are covered with small scales that rub off easily.

Order: Coleoptera Means sheath wings. This order includes beetles. They have a pair of hardened wings which cover the top of the body and meet in a straight line down the back. They do have two pairs of wings, but the second pair (or flight wings) are not often seen because they are folded under the front ones while at rest.

Order: Orthoptera Means straight wings. This order includes crickets, katydids, and grasshoppers. These insects have long back legs, hop high in the air, and often make rhythmic sounds. They have thin leathery forewings that cover larger hind wings that are folded like a fan when at rest.

Order: Odonata Means tooth, in reference to the teeth on the mouthparts. This order includes dragonflies and

Background (cont):

damselflies. These insects have two pairs of long, narrow membranous wings that are roughly equal in size. They also have large eyes and long, narrow abdomens.

Order: Homoptera Means same wings. This order includes aphids, cicadas and leafhoppers. These insects hold their two pairs of wings in a tent-like position over their body when at rest.

Order: Hemiptera Means half-wings. This order includes bugs, backswimmers, and water striders. The most distinguishing mark for these insects is the triangle that is on the back. This is formed by the way the insects fold their forewings when at rest. The insects in this order are the only ones that should be called true "bugs".

See pp. 30 - 41 in *Eyewitness Books: Insect* for more info.

Starting Out, Action, and Tying It All Together:

- Follow directions in **OBIS Activity - *Animal Diversity***.

Branching Out or Alternative to OBIS Outdoor Activity:

Students identify some common Nebraska insects.

- Copy pp. 40 - 41 in the ***4-H Entomology Manual*** for each student or groups of students.
- Select 5 work stations.
- Place one paper wasp and one June bug at the each work station. Place a copy of the **OBIS *Lawn Guide*** and 4 magnifying glasses at each station.
- Set up the posters in a visible place.
- Ask the students to name some of the different kinds of insects that they know. Write each one on the board.
- Show the students **Reading Rainbow's Video Tape - *Bugs***.
- Divide the students into 5 groups and send each group to a station.
- Pass out the Insect Order Key from the *4-H Entomology Manual* to each student.
- Working together have each group figure out what orders the two insects at their station belong to. They can refer to the *Lawn Guide* for help.
- While they are working pass around the insect order plasmo-mount so that they can see the differences between several different insect orders.
- When they are finished, have each group bring up to the teacher's desk their insects and write their answers on the blackboard. Figure out what the consensus is and then work them through the key to arrive at the correct answers (June bug - *Coleoptera*; paper wasp - *Hymenoptera*). Using the *Eyewitness Insect* Book, show them pp. 30-41 for pictures of various other insects from each order.
- To wrap up, ask the class the following questions:
  What characteristics helped you decide the identity of your insects?
  What interested you most about any one of the insects?
  Which insects are true bugs?
  If the students want more challenges, let them key out some of the other insects in this kit.

Activity Three – Invent an Insect

Learning Objective:
Students investigate camouflage and mimicry.

American dagger moth. Photo: www.edupic.net, EduPic Graphical Resource.

Activity Three – Invent an Insect

Group size: Any

Time: 45-60 minutes

Materials Provided:

- OBIS Activity - *Invent an Animal*
- 2 Insect Specimens:
  Morpho butterfly
  Monarch butterfly
- 5 Boxes with insect specimens (Included in Insect Adaptations Activity)

Additional Materials Provided:

- *Eyewitness Books: Insect*

See OBIS Activity Card for materials necessary for activity.

Additional Supplies Needed Per Student:

- Blank index card or 3x5 piece of white paper
- Crayons or markers
- Scissors

Preparation:

- Follow instructions in OBIS Activity - *Invent an Animal*

Background:

Color is important in the insect world. While we see a diversity of colors as being esthetically pleasing, to insects color may be a matter of life and death.

There are three basic ways that insects (and other animals as well) use color to stay alive: as camouflage, as a warning to predators, and to imitate other insects (called mimicry).

Many insects have both color and shape adaptations that allow them to blend in with their habitat or surrounding environment. Some insects have body forms that look like sticks, leaves, thorns, flowers, bark, and even bird droppings. Insects use this camouflage to hide; some from their predators, some from their prey.

Another way insects use color is as a warning. In the insect world, the colors black and yellow or black and orange send a warning message to predators. The warning is that the insect tastes bad, is poisonous, or can bite or sting. Examples of insects that use warning coloration are the Monarch butterfly, bees and wasps.

The third way insects use color is to mimic other insects. Some harmless insects, like the viceroy butterfly, are able to escape predation because they look and act like insects that are poisonous. The Viceroy butterfly is able to escape predation because predators mistake it for the bad tasting Monarch.

See pp. 44 - 47 in *Eyewitness Books: Insect* for pictures and further information.

Starting Out:

Ask the students to look at how the class is dressed today.

Is anyone wearing clothes that makes them stand out or attract attention to themselves?
Is anyone wearing clothes that make them blend in with their environment?
What types of environments or surroundings do insects live in?
What colors would help them to hide in those environments?
What colors would make them stand out?

Action, and Tying It All Together:

- Follow directions in **OBIS Activity - *Invent an Animal*.**

Branching Out or Alternative to OBIS Outdoor Activity:

Students create and camouflage insects to hide in the classroom.

- Decide on 4 habitats to use for hiding insect creations. Consider using classroom habitats such as teacher's desk drawer, a student desk, a colorful bulletin board, etc.
- Hand out an index card to each of the students and ask them to get out crayons and scissors.
- Explain that with this card each student is to create and camouflage an insect so that its color and shape allows it to blend in with their group's habitat (hiding or burying not allowed). Once the insects have been placed, students from the other groups will try to find them.
- Divide the class into 4 groups. Assign each group to its own habitat and allow them time to study it and choose homes for the insects they will create.
- After specific habitats have been selected let the students create their insects. Remind them of the basic parts that all insects need to have (refer to background information in the Insect Adaptations activity). Allow them to return to their habitat to check out color and pattern matches while they are creating their insect.
- When the students finish their insects have students place them in their appropriate habitats. If they have time they may want to design and camouflage more than one insect.
- After everyone has finished at least one insect, call the class together. Find out from each group how many insects were placed in their habitat.
- Assign each group to another group's habitat to search for the imaginary insects.
- As they find them, have the hunters pick up the camouflaged insects.
- Stop the search after 5-10 minutes. Call the class together at one of the habitats.
- Ask the insect creators for this habitat if all of their insects have been found. Ask the creators of any undiscovered animals to point out their camouflaged creations. Keep these hard to find insects separate from the others.
- Go to each of the other 3 habitats and do this same process. After all habitats have been visited, place all of the insect creations into two groups - ones that were easy to find and ones that were hard to find.
- To wrap up, ask the following questions:

  Why were some animals hard to find?
  Why were some easy to spot?
  If you had been a predator, looking for food, which insects would have survived?
  In what other habitats would your creations be camouflaged?
- Show the insect specimens included in the kit.
- Based on the insects' coloration, have the students make a guess as to the animal's natural habitat.

  How do you think color and shape help these insects survive?
  Why do you think some of these insects are brightly colored?

Activity Four – How Many Can There BEE?

Learning Objective:
Students examine insects' biological success and estimate population numbers.

Photo by Elisabetta Grondona/stock.xchng

Activity Four – How Many Can There BEE?

Group size: Any

Time: 60 minutes

See OBIS Activity Card for materials necessary for activity.

Materials Provided:

- Vial of plastic ants
- OBIS Activity - *Bean Bugs*

Preparation:

- Follow instructions in OBIS Activity - *Bean Bugs*.

Background:

We are told that insects account for at least 80% of all the known species of animals. According to a study, done by Terry Erwin of the Smithsonian Institution, there are 10-30 million insect species, but we have described only one million so far. Imagine, one out of every four living things on earth is a beetle!

Why are there so many insects? Insects are successful at surviving for several reasons.

~ They can adapt to almost any living conditions.
~ They are small in size, and they can live and find food and shelter in spaces too small for other animals.
~ They have armor - an exoskeleton (hard outer shell) to protect their internal organs.
~ They have a high reproductive potential.

Background (cont):

Insects occur everywhere on the globe except the polar regions and the open ocean. A great deal of the success of insects is due to their powers of reproduction. Most insects have short lifecycles in which they quickly become adults and reproduce. Most insects lay many eggs, and many are able to produce several generations in one season. There are many stories about the amazing reproductive ability of insects. For example, fruit flies are very small and develop rapidly. They may have as many as 25 generations per year (under ideal conditions). Females lay approximately 100 eggs, and about half of those develop into females. If one pair of flies and its descendants could reproduce with no mortality, the number of flies in the 25th generation (after only one year) would be astounding. If packed tightly together (1000 flies to a cubic inch) they would form a **ball of flies 96 million miles in diameter** . . . or a ball extending from the earth to the sun!

In about one square yard or meter of your backyard, there are probably between 500 and 2,000 insects. Many times scientists want to find out what the population of insects in a certain area is, but the numbers are too large for each individual to be counted. The numbers must then be accurately estimated. One way to do this is to use the quadrat method. By taking a small area (one quadrat), counting the number of insects in the quadrat, and then multiplying by the number of quadrats in the total study site, an estimate can be made of the approximate total insects. See the OBIS activity - *Bean Bugs*, for further information

Starting Out

Ask the students the following questions:

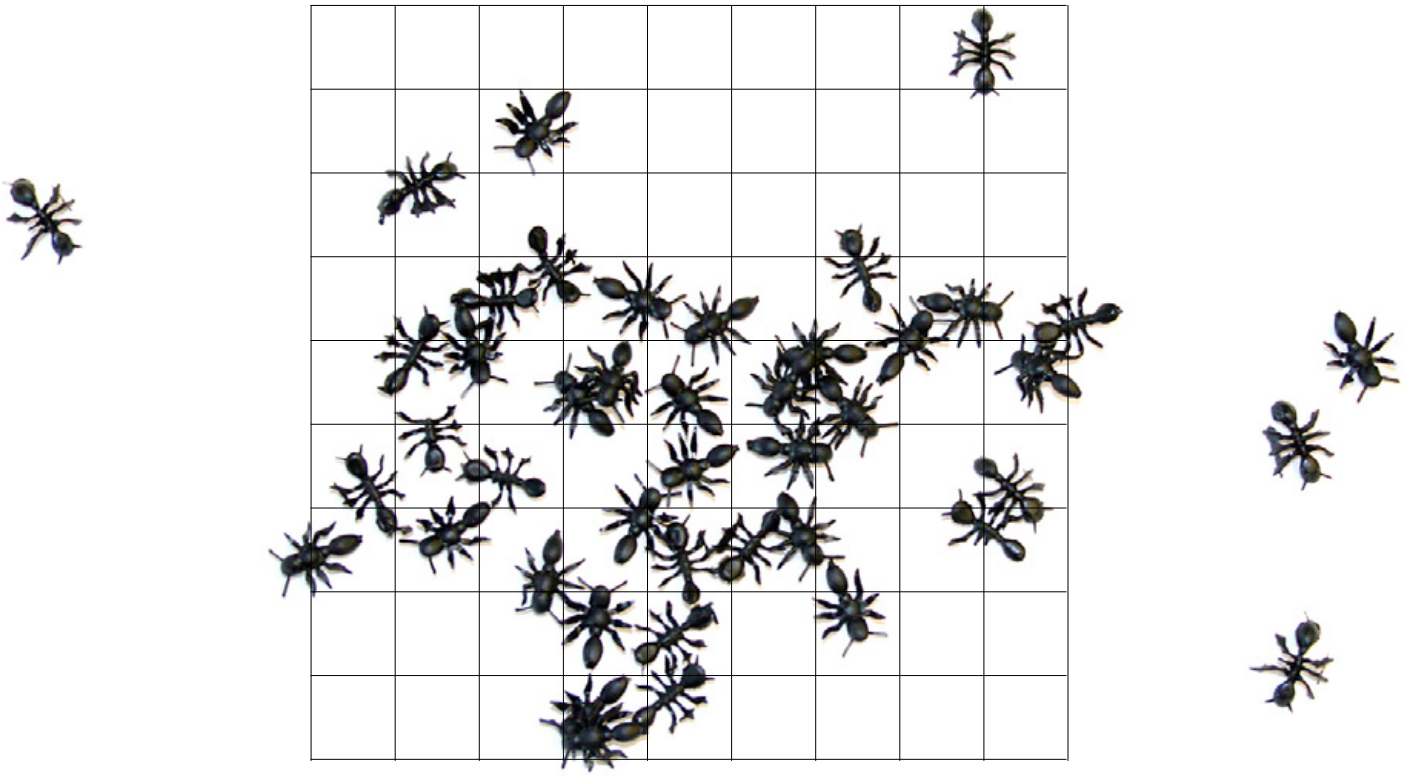
- Which animal group has the most individuals in the world?
- How many different types of insects do you think there are?
- Why are there so many insects?
- How would you figure out how many insects are living in your backyard?

Action, Tying It All Together:

Follow directions in **OBIS Activity - *Bean Bugs***.

Branching Out:

Do the Challenge from the OBIS Activity - *Bean Bugs*. Use the vial of plastic ants for the students to "estimate the number of individuals in a population too numerous to count." After students have made an estimate have one person open vial and count the ants to see who came closest.



Activity Five – Snug as a Bug

Learning Objective:
Students create and examine a number of insect homes.

Activity Five – Snug as a Bug

Group size: Any

Time: 50 minutes

Materials Provided:

- 5 Bagworm homes
- 5 Paper wasp's nests
- 5 Paper wasps (included in Insect Diversity Activity)
- 1 Large paper wasp nest
- OBIS Activity - *Snug as a Bug*

Additional Materials Provided:

- *Eyewitness Books: Insect*

Additional Materials Needed:

- See OBIS Activity Card for materials necessary for activity.

Preparation:

Follow directions in OBIS Activity - *Snug as a Bug*

Background:

See OBIS Activity Card - *Snug as a Bug*

Please refer to pp. 24 - 29 for information on insect life cycles and to pp. 50 - 59 in *Eyewitness Books: Insect* for pictures of insect homes.

Included in this kit are two examples of insect homes in case you cannot get out to find homes outside.

The first home that is included in this kit is from an insect called an evergreen bagworm moth. This home looks like a small evergreen bag. Bagworm moths get their name from the bags the larvae construct to live in. Bagworm moths overwinter as eggs within their parent's bag. After hatching in spring, the larva leaves the parent's bag and starts to create its own case or bag around itself as it feeds. When the larva is mature, it fastens the bag to a twig or other secure object and pupates inside the bag. Pupation lasts several weeks, after which males emerge and seek out females, who emerge from their pupae but not from their bags (because they are wingless). The male fertilizes the female through the tip of the bag. She then lays eggs inside the bag, exits, and dies.

In the winter in Nebraska these bags can be found hanging from trees or attached to branches. The bag is attached to a branch with silk. The attached end of the bag is where the head and feet of the larva used to protrude as the larva moved about and fed. At the bottom of the bag there is a small opening. This is where the shed skins and feces of the developing larva were expelled.

The second home included in this kit is a portion of a paper wasp nest. Paper wasps make paperlike nests in which they raise their young. Fertile female wasps (queens) emerge in the spring and build paper cells from collected material such as fibers from dry wood, paper, or stems of weeds. The wasp grasps the fibers in its mouth and peels off a thin strip. This strip is formed into a ball and carried back to the nest in the queen's mouth. The balls are connected with water which the wasp drinks and then regurgitates to connect the fibers.

After the nests are built, the queens lay eggs in the cells. The eggs hatch into larvae in about two weeks. The queen feeds them for another two weeks, and then the larvae pupate (inactive stage of metamorphosis between the larval and adult stage). After pupation the mature wasps that emerge are sterile females, and they do all the caring for the young that develop from eggs the queen continues to lay. In late summer, certain young develop into fertile females and males.

Starting Out, Action, Tying It All Together, Branching Out:

- Follow directions in **OBIS activity - *Snug as a Bug***.
- Included in this kit for use with this activity are specimens of actual insect homes. If you do not find insect homes outside, then these can be used instead.

Pillbugs, sometimes called woodlice or rolly pollies, live under rocks or logs and in moist leaf litter.
Photo: www.edupic.net, EduPic Graphical Resource.

Nebraska Science Standards

Activity 1: Insect Adaptations

Objectives: Students explore different types of insect features.

Grades K-2

SC K-12.1 **Inquiry, the Nature of Science, and Technology**

1. Abilities to do Scientific Inquiry

SC 2.1.1 Students will ask questions and conduct investigations that lead to observations and communication of findings.

Scientific Observations: SC 2.1.1.d Describe objects, organisms, or events using pictures, words, and numbers.

Scientific Communication: SC 2.1.1.f Use drawings and words to describe and share observations with others.

SC K-12.3 **Life Science**

1. Structure and Function of Living Systems

SC 2.3.1 Students will investigate the characteristics of living things.

Characteristics of Living Organisms: SC 2.3.1.c Identify external parts of plants and animals.

Grades 3-5

SC K-12.1 **Inquiry, the Nature of Science, and Technology**

1. Abilities to do Scientific Inquiry

SC 5.1.1 Students will plan and conduct investigations that lead to the development of explanations.

Scientific Observations: SC 5.1.1.d Make relevant observations and measurements.

Scientific Interpretations, Reflections, and Applications: SC 5.1.1.f Develop a reasonable explanation based on collected data.

Scientific Communication: SC 5.1.1.g Share information, procedures, and results with peers and/or adults.

SC K-12.3 **Life Science**

1. Structure and Function of Living Systems

SC 5.3.1 Students will investigate and compare the characteristics of living things.

Characteristics of Living Organisms: SC 5.3.1.b Identify how parts of plants and animals function to meet basic needs.

Activity 2: Insect Diversity

Objectives: Students discover the many different kinds of insects and identify the eight common insect orders.

Grades K-2

SC K-12.1 **Inquiry, the Nature of Science, and Technology**

1. Abilities to do Scientific Inquiry

SC 2.1.1 Students will ask questions and conduct investigations that lead to observations and communication of findings.

Scientific Investigations: SC 2.1.1.b Conduct simple investigations.

Scientific Tools: SC 2.1.1.c Select and use simple tools appropriately.

Scientific Observations: SC 2.1.1.d Describe objects, organisms, or events using pictures, words, and numbers.

Scientific Data Collection: SC 2.1.1.e Collect and record observations.

Scientific Communication: SC 2.1.1.f Use drawings and words to describe and share observations with others.

SC K-12.3 **Life Science**

1. Structure and Function of Living Systems

SC 2.3.1 Students will investigate the characteristics of living things.

Characteristics of Living Organisms: SC 2.3.1.d Observe and match plants and animals to their distinct habitats.

Grades 3-5

SC K-12.1 **Inquiry, the Nature of Science, and Technology**

1. Abilities to do Scientific Inquiry

SC 5.1.1 Students will plan and conduct investigations that lead to the development of explanations.

Scientific Investigations: SC 5.1.1.b Plan and conduct investigations and identify factors that have the potential to impact an investigation.
Scientific Tools: SC 5.1.1.c Select and use equipment correctly and accurately.
Scientific Observations: SC 5.1.1.d Make relevant observations and measurements.
Scientific Data Collection: SC 5.1.1.e Collect and organize data.
Scientific Interpretations, Reflections, and Applications: SC 5.1.1.f Develop a reasonable explanation based on collected data.
Scientific Communication: SC 5.1.1.g Share information, procedures, and results with peers and/or adults.

2. Nature of Science

SC 5.1.2 Students will describe how scientists go about their work.

Activity 3: Invent an Insect

Objectives: Students investigate camouflage and mimicry.

Grades K-2

SC K-12.1 **Inquiry, the Nature of Science, and Technology**

1. Abilities to do Scientific Inquiry

SC 2.1.1 Students will ask questions and conduct investigations that lead to observations and communication of findings.

Scientific Investigations: SC 2.1.1.b Conduct simple investigations.

SC K-12.3 **Life Science**

1. Structure and Function of Living Systems

SC 2.3.1 Students will investigate the characteristics of living things.

Characteristics of Living Organisms: SC 2.3.1.d Observe and match plants and animals to their distinct habitats.

Grades 3-5

SC K-12.1 **Inquiry, the Nature of Science, and Technology**

1. Abilities to do Scientific Inquiry

SC 5.1.1 Students will plan and conduct investigations that lead to the development of explanations.

Scientific Investigations: SC 5.1.1.b Plan and conduct investigations and identify factors that have the potential to impact an investigation.
Scientific Observations: SC 5.1.1.d Make relevant observations and measurements.

SC K-12.3 **Life Science**

1. Structure and Function of Living Systems

SC 5.3.1 Students will investigate and compare the characteristics of living things.

Activity 4: How Many Can There Bee?

Objectives: Students examine insects' biological success and estimate population numbers.

Grades K-2

SC K-12.1 **Inquiry, the Nature of Science, and Technology**

1. Abilities to do Scientific Inquiry

SC 2.1.1 Students will ask questions and conduct investigations that lead to observations and communication of findings.

Scientific Investigations: SC 2.1.1.b Conduct simple investigations.
Scientific Tools: SC 2.1.1.c Select and use simple tools appropriately.
Scientific Data Collection: SC 2.1.1.e Collect and record observations.
Scientific Communication: SC 2.1.1.f Use drawings and words to describe and share observations with others.

Grades 3-5

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Scientific Data Collection: SC 5.1.1.e Collect and organize data.

Scientific Interpretations, Reflections, and Applications: SC 5.1.1.f Develop a reasonable explanation based on collected data.

Scientific Communication: SC 5.1.1.g Share information, procedures, and results with peers and/or adults.

2. Nature of Science

SC 5.1.2 Students will describe how scientists go about their work.

Activity 5: Snug as a Bug

Objectives: Students create and examine a number of insect homes.

Grades K-2

SC K-12.1 **Inquiry, the Nature of Science, and Technology**

1. Abilities to do Scientific Inquiry

SC 2.1.1 Students will ask questions and conduct investigations that lead to observations and communication of findings.

Scientific Investigations: SC 2.1.1.b Conduct simple investigations.

Scientific Observations: SC 2.1.1.d Describe objects, organisms, or events using pictures, words, and numbers.

SC K-12.3 **Life Science**

1. Structure and Function of Living Systems

SC 2.3.1 Students will investigate the characteristics of living things.

Characteristics of Living Organisms: SC2.3.1.b Identify the basic needs of living things.

2. Heredity

SC 2.3.2 Students will recognize changes in living things.

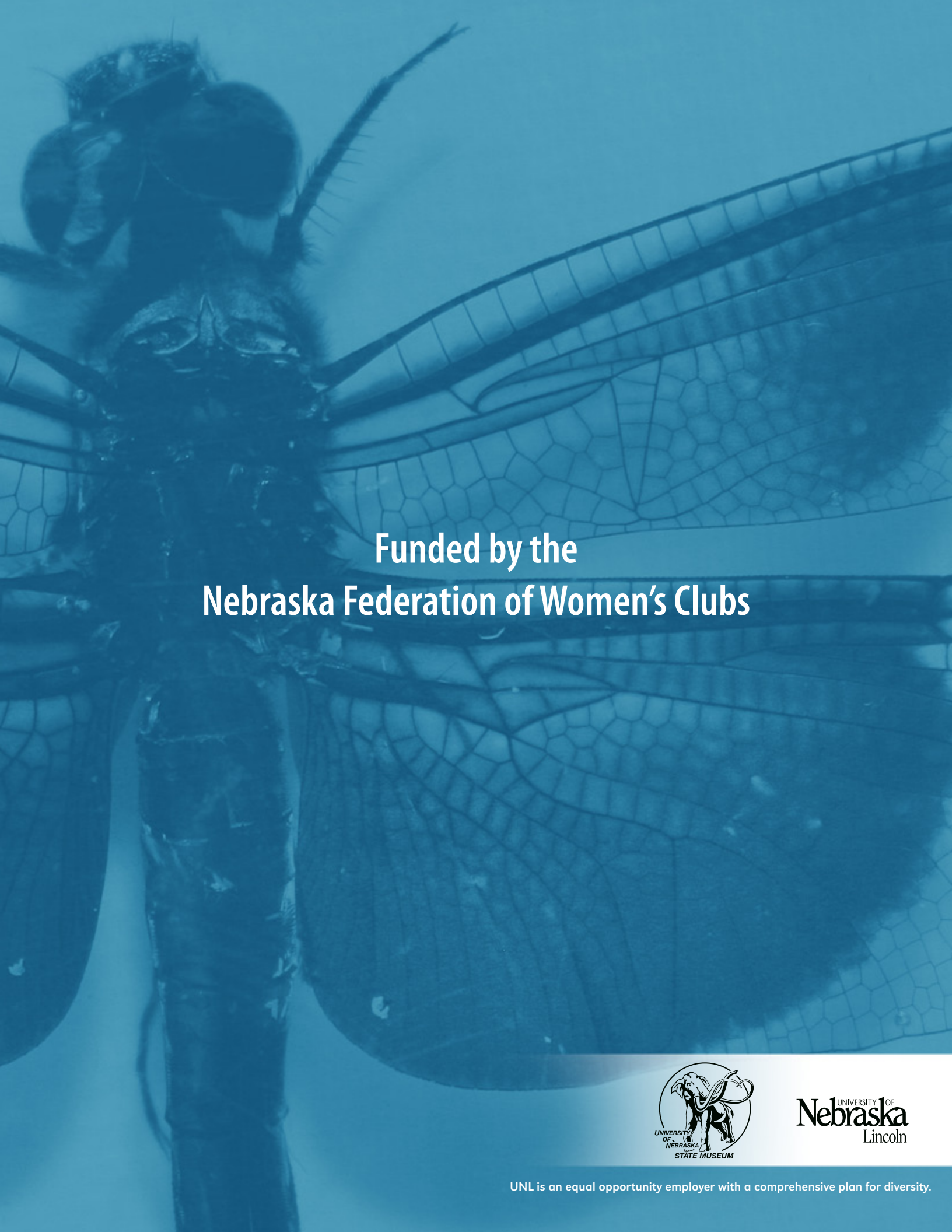
Grades 3-5

SC K-12.1 Inquiry, the Nature of Science, and Technology

1. Abilities to do Scientific Inquiry

SC 5.1.1 Students will plan and conduct investigations that lead to the development of explanations.

Scientific Observations: SC 5.1.1.d Make relevant observations and measurements.



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