Animals 2

Insects and Spiders

Teacher's Guide

MESS®
Marvelous Explorations through Science and Stories

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Teacher Background Information

What is the focus of this Kit?

The focus of this Kit is some of the smaller animals that inhabit our world: insects and spiders. These fascinating creatures provide young children many hands-on opportunities to learn about the diversity of living things, how living things change and grow during their life cycles, and the inter-connectedness of the natural world.

What science concepts are covered in this Kit?

- There are many different kinds of insects and spiders.
- Insects and spiders have distinctive characteristics that help us identify them.
- Insects and spiders grow and change during their life cycle.
- Insects and spiders are important parts of our natural world.
- Insects and spiders have adaptations that help them survive.

What do insects and spiders have in common?

Insects and **spiders** are both a type of animal known as **arthropods**. All arthropods are **invertebrates** (they do not have backbones). Other features arthropods share are a hard, segmented outer covering called an **exoskeleton** and jointed legs.

Arthropods are classified into many groups based primarily on the number and arrangement of body parts. For example, insects have three body parts and six legs. In contrast, spiders have two body parts and eight legs. People often lump all “creepy crawlies” into one group, and they frequently call this group “bugs.” In fact, **bugs** are just one group of insects. Worms are not insects (they do not have an exoskeleton or any legs). Centipedes are not insects (they have too many legs). However, centipedes are arthropods, as are roly-polies, scorpions, crabs, shrimp, lobsters, and ticks.

Insect Characteristics

Bodies. The three body parts of an insect are the head (which includes the mouth, eyes, and **antennae**), **thorax** (where the legs and wings are connected), and **abdomen** (which contains the digestive organs, reproductive organs, breathing holes called **spiracles**, and, if there is one, a stinger).

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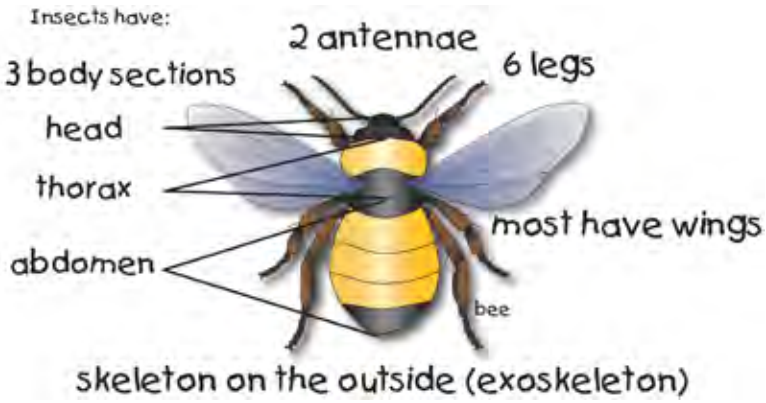
Antennae. Most adult insects have two antennae. They use their antennae to feel, smell, and taste the world around them. The size and shape of antennae vary greatly from one type of insect to another.

Wings. Many, but not all, insects have wings at some point in their life cycle. Ants and termites have wings but lose them after they mate. Butterflies have wings, but their **larvae** (also called **caterpillars**) do not. Silverfish and lice never have wings.



Eyes. Most insects have two **compound eyes** (although insects that live in places that are completely dark, like caves, have no eyes). Compound eyes have multifaceted surfaces that let the insect see many images rather than just one. The sharpness of the image the insect sees depends on the number of eye facets. Insects cannot see long distances. They are, however, very good at detecting motion.

Diet. Insects eat many different things. Many insects eat plants. Some eat other insects and spiders. Mosquitoes and fleas suck blood when they bite humans or other animals. Many bees and butterflies drink nectar from flowers.

Communication. Insects communicate with one another using sound, visual cues, touch, and chemical signals. Insects produce sound in a variety of ways. Beetles bang their body parts on hard surfaces. Crickets and grasshoppers make sounds by rubbing together body parts. Cicadas—the loudest of all insects—use drum-like membranes on the sides of their abdomens to produce sound.

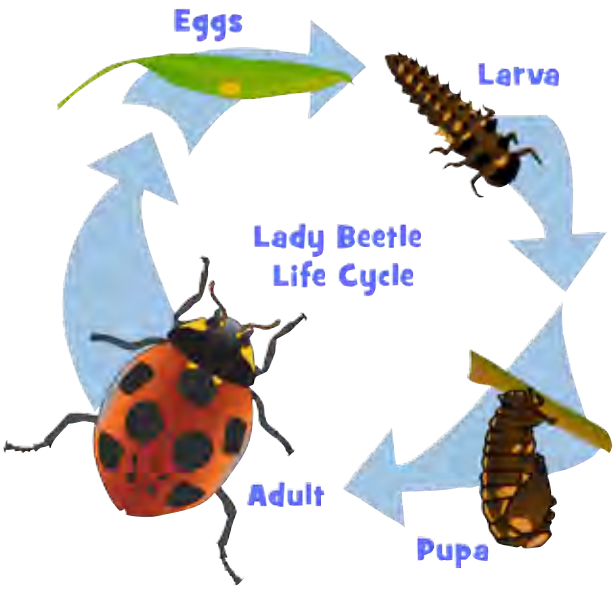
Other insects use visual communication. Male and female fireflies produce different patterns of light that help them locate one another. The colorful patterns on the wings of butterflies also play a role in courtship. When an ant finds food, it lets the other ants in its colony know by leaving a trail of a special chemical as it

heads back to the nest. Nest mates pick up the scent using the sensory hairs on their antennae.

When scout bees find a food source, they communicate its location to other bees by “dancing.” Bees have two basic dances—a round dance and a waggle dance. In the round dance, the bee that has found food circles one way and then the other over and over again. In the waggle dance, the bee dances in the form of a figure “8.” Bees do the round dance when the food source is nearby and the waggle dance when food is farther away.

Metamorphosis. All insects change as they grow from eggs into adults. Some insects, such as grasshoppers and crickets, resemble their adult form upon hatching, but are smaller and lack some parts, such as wings. At this stage, these insects are called **nymphs**. As the nymphs grow into adults, they may shed their skin several times and develop those missing parts. This growth process is called **incomplete metamorphosis.**

Most insects undergo **complete metamorphosis**, in which they completely change their form as they grow from juveniles to adults. The butterfly may be the best known example of complete metamorphosis, but other insects such as beetles and bees undergo this process as well. Amphibians (e.g., frogs, toads and salamanders) also go through a metamorphosis.



In insects with complete metamorphosis, the **larvae** hatch from eggs. Larvae look similar to worms—but have legs—and eat a different diet than they do as adults. As the larvae grow, they shed their skin several times. They then change into **pupae**; during this stage, their bodies break down and reorganize. Some moths and a few other insects spin silk **cocoons** around their pupae, though butterflies

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rarely do. Adult insects emerge from the pupae days to months later, depending on the type of insect. Unlike the larvae, adults typically can fly.

Butterfly metamorphosis. After hatching from an egg, the butterfly larva or caterpillar spends the majority of its time eating. Most caterpillars eat the leaves of only a single type of plant. This is called the **host plant** for that caterpillar. A caterpillar will die rather than eat other plants. A caterpillar can eat twice its own weight each day. In the process, it produces an impressive amount of waste or **frass**. As it grows, the caterpillar sheds its skin four to nine times.

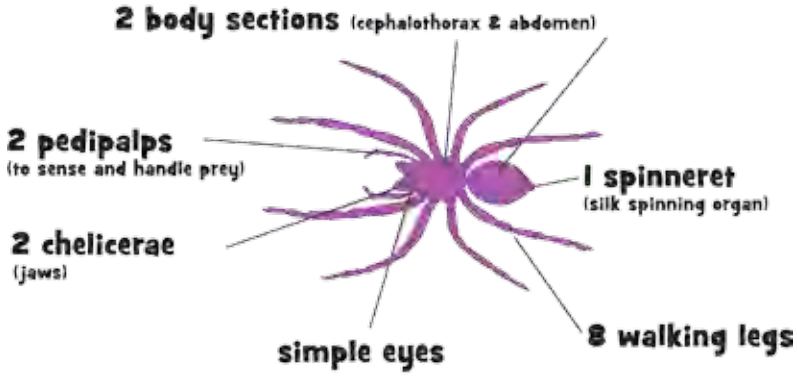
When the caterpillar reaches full size, it hangs upside down by a piece of silk and sheds its skin one last time before becoming a **pupa.** The pupa of a butterfly is also called a **chrysalis**. During this stage, which takes between two weeks and several months, the tissue is reorganized into the adult form.

When the butterfly is fully formed, the pupal case splits open and the butterfly emerges with wings, three body parts, six legs, antennae, and a sucking mouthpart called a **proboscis**.

Spider Characteristics

Spiders are not insects. Although both are arthropods, insects and spiders are very different. For one thing, spiders do not undergo metamorphosis. Rather, when baby spiders (**spiderlings**) hatch, they look like tiny versions of the adults.

Bodies. All spiders have two body parts—the **cephalothorax** and abdomen. The cephalothorax includes the mouth, eyes, fangs, eight legs, and two **pedipalps**. The abdomen contains the breathing organs, reproductive organs, digestive organs, and **spinneret**.



Eyes. Spiders have simple eyes, instead of compound eyes like insects. Most spiders have eight eyes arranged in two rows of four.

Some spiders, such as the brown recluse, have six eyes arranged in three pairs. Jumping spiders have two huge eyes and six smaller eyes; they are reported to have the best eyesight of any arthropod.

Webs. All spiders produce silk from their spinnerets, or silk glands, but not all spiders make webs. Spiders use their silk to wrap egg sacks and some use it to line a nest in the ground or make a trap.

Spider webs come in all shapes and sizes. Black widow spiders spin “tangle webs” that look just like the name suggests. Some spiders spin large round “orb” webs. The golden silk orbweaver (known in Florida as a banana spider) spins this kind of web. The silk from a golden silk orbweaver spider is stronger than steel of the same diameter. Funnelweb spiders make a funnel trap out of silk and wait for prey to fall into it. Trapdoor spiders make burrows in the ground with a camouflaged door made of silk and soil.

Spiders do not stick to their own webs because they know which strands are sticky and which are not. They also have oil on their feet that keeps them from sticking. Insect prey usually are not as lucky.

Diet. Many spiders eat insects, worms, and other spiders. Some eat lizards, fish, and even birds! To subdue their prey, a spider may inject venom into the bite to kill or paralyze the victim before sucking out its insides.

Is spider venom dangerous to humans? A few spiders do produce venom in sufficient amounts and toxicity to harm humans (especially children). Spiders found in North America that produce venom poisonous to humans are the black widow, brown widow, red widow, and brown recluse. The venom of these spiders can cause illness and even death. Spiders do not, however, prey on people or other large mammals and will only bite in self-defense. Spiders will not bother people if left alone.

Why are insects and spiders important?
Insects and spiders are an important part of the natural world. They pollinate crops, help control pests, and are food for other creatures. Insects also produce materials that humans find useful, such as honey, silk, and wax.

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What steps should I take to ensure that our exploration of insects and spiders is safe and productive?

Before you begin, talk with families to learn about their children's potential allergies and fears, as well as attitudes of other family members toward insects and spiders. This will allow you to interact more effectively with each child.

Survey your outdoor area so that you are aware of places where you are likely to find insects and spiders, as well as hazards such as fire ant hills and wasp nests that should be treated and avoided. You can attract insects by creating dark damp places using a rotting log, piece of lumber, or old flower pot on the ground. Planting herbs and flowers also can attract insects.

Establish a set of rules for children to follow when exploring nature both indoors and outside. Insist that children ask an adult before touching an unfamiliar animal or plant. Teach the children how to use tools such as specimen viewers and magnifying lenses so that they can collect and examine insects and spiders without harming the animals or themselves.

Reflect on your own attitudes toward insects and spiders. Children readily pick up the attitudes of the adults around them. Try not to let your own likes and dislikes influence theirs. If you are very uncomfortable around specific animals, help children learn to appreciate them from a safe distance. Just remember that the most important thing you can do is instill curiosity and appreciation of the nature that surrounds us.

This guide provides only a brief introduction to a few insects and spiders. You are likely to encounter other insects and spiders and will have many questions that are not answered here. A vast amount of information is available about insects and spiders in books and on the internet. Some recommended web sites include:

Koday's Kids Amazing Insects
http://www.ivyhall.district96.k12.il.us/4TH/KKHP/1insects/bugmenu.html

Backyard Nature
http://www.backyardnature.net/

Institute of Food and Agricultural Sciences, University of Florida
http://www.ifas.ufl.edu/

Florida's Wildflowers and Butterflies, Florida Museum of Natural History, University of Florida
http://www.flmnh.ufl.edu/wildflower/

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Teacher Vocabulary

abdomen – an insect or spider body part that contains the digestive, reproductive, and breathing organs

antenna – the long, paired, moveable, sensing organ on the head of an arthropod

arthropod – the group of invertebrate animals with exoskeletons, segmented bodies, and jointed limbs

bug – also known as “true bugs,” one group of insects

caterpillar – the larva of a butterfly or moth

cephalothorax – one of two spider body parts; consists of a fused head and thorax

chrysalis (chrysalides, plural) – the pupa of a butterfly

cocoon – the silken covering that surrounds and protects the pupa of some moths and other insects; the egg case of a spider is also a type of cocoon

complete metamorphosis – the growth process in which the form of the animal changes completely; the process for insects involves four distinct stages:

egg, larva, pupa, and adult

compound eye – an eye with multiple lenses that enables insects and crustaceans to see objects and detect motion efficiently but with limited distance

exoskeleton – the hard outer shell that serves as an external skeleton for arthropods

frass – insect waste or excrement

host plant – the specific plant that an adult butterfly lays eggs on and that provides food for the caterpillar

incomplete metamorphosis – the growth process in which the juvenile form resembles the adult, but is smaller and lacks some parts; the process involves three stages: egg, nymph, and adult

insect – the class of arthropods with three body parts and six legs

invertebrate – the category of animals that do not have backbones or spinal columns

larva (larvae, plural) – the immature, usually worm-like stage of an insect that is undergoing metamorphosis

metamorphosis – a process in which an animal changes shape and form as it grows from an egg to a mature adult

nymph – the immature stage of insects that go through incomplete metamorphosis

pedipalp – one of a pair of appendages that a spider uses to hold its food

proboscis – a tube-like mouth part that some insects use to suck liquid when feeding

pupa (pupae, plural) – the stage of insect metamorphosis during which the body is completely remodeled

spiderling – an immature spider

spider – the class of arthropods with two body parts and eight legs

spinneret – the silk-producing organ of a spider, located on the abdomen

spiracle – the small openings on the abdomen through which an insect breathes

thorax – the middle body part of an insects where legs and wings are located

MESS® Materials for Core and Center Experiences

Materials	Books & Other Media
Experience 1: Introduction to Insects and Spiders	
large rubber insect and spider models specimen viewers petri dishes live insects such as a caterpillar (optional) camera DVD/video player (optional) television (optional)	*Bugs Don't Bug Us!* DVD/video *About Insect*s by Cathryn Sill *About Arachnids* by Cathryn Sill *Aaaarrgghh! Spider!* by Lydia Monks *Insects Are My Life* by Megan McDonald *Be Nice to Spiders* by Margaret Bloy Graham *My Father's Hands* by Joanne Ryder *Songs about Insects, Bugs and Squiggly Things* CD by Jane Murphy
Experience 2: What Is an Insect?	
simple poster or illustration showing the parts of an insect large rubber insect models insect plastomounts magnifying tools specimen viewers petri dishes dead insects	*About Insect*s by Cathryn Sill *Bugs Are Insects* by Anne Rockwell *Insects* by Robin Bernard
Experience 3: What Is a Spider?	
large rubber spider and insect models spider plastomount simple poster or illustration showing the parts of a spider magnifying tools	*About Arachnids* by Cathryn Sill *Are You a Spider?* by Judy Allen *Aaaarrgghh! Spider!* by Lydia Monks *Spinning a Web* by Lisa Trumbauer *Spiders* by Nic Bishop *The Very Busy Spider* by Eric Carle *Songs about Insects, Bugs and Squiggly Things* CD by Jane Murphy

Materials	Books & Other Media
Experience 4: Looking for Insects colander shovel small stones plastic cup food scraps tile white paper magnifying tools specimen viewers camera	*Bugs Are Insects by Anne Rockwell* *Ugh! A Bug* by Mary Bono *Bug Safari* by Bob Barner
Experience 5: Metamorphosis large rubber butterfly models butterfly life cycle poster, puzzle, model, or card set	*Caterpillar Caterpillar* by Vivian French *A Ladybug's Life* by John Himmelman *The Bumblebee Queen* by April Pulley Sayre *A Luna Moth's Life* by John Himmelman *Monarch Butterfly* by Gail Gibbons *Songs about Insects, Bugs and Squiggly Things* CD by Jane Murphy
Experience 6: From Caterpillar to Butterfly butterfly pavilion butterfly life cycle poster, puzzle, model, or card set butterfly larvae (caterpillars) appropriate host plants paper towels watering can camera	*Waiting for Wings* by Lois Ehlert *Becoming Butterflies* by Anne Rockwell *Are You a Butterfly?* by Judy Allen *Where Butterflies Grow* by Joanne Ryder *I'm a Caterpillar* by Jean Marzollo
Experience 7: Insect Communication recordings of insect sounds corresponding insect photos CD/tape player or computer	*The Very Quiet Cricket* by Eric Carle *Are You a Grasshopper?* by Judy Allen *Songs about Insects, Bugs and Squiggly Things* CD by Jane Murphy

MESS® Materials for Core and Center Experiences

Materials	Books & Other Media
Experience 8: Introduction to Ants simple poster or illustration showing the parts of an insect ant model ant hill food scraps specimen viewer camera	*Thinking about Ants* by Barbara Brenner *The World of Ants* by Melvin Berger *Are You an Ant?* by Judy Allen *Bug Safari* by Bob Barner *Songs about Insects, Bugs and Squiggly Things* CD by Jane Murphy
Experience 9: Investigating Ants 1 ant hill food scraps paper plate marker camera small insect models	*Thinking about Ants* by Barbara Brenner *The World of Ants* by Melvin Berger *What is a Scientist?* by Barbara Lehn
Experience 10: Investigating Ants 2 ant hill food scraps block or other obstacle camera small insect models	*Thinking about Ants* by Barbara Brenner *The World of Ants* by Melvin Berger *What is a Scientist?* by Barbara Lehn
Experience 11: Insect Vision simple poster or illustration showing the parts of an insect insect glasses dragonfly model	*Bug Faces* by Darlyne Murawski *Are You a Dragonfly?* by Judy Allen
Experience 12: Camouflage plastic/rubber butterfly collection colorful patterned paper or fabric	*How to Hide a Butterfly and Other Insects* by Ruth Heller *Insects* by Robin Bernard *Animals in Hiding* by Melvin Berger

Experience 1

Introduction to Insects and Spiders

Science Concepts

There are many different kinds of insects and spiders.

Insects and spiders are important parts of our natural world.

Aim

Children will learn appropriate ways to interact with insects and spiders.

Materials

large rubber insect and spider models
specimen viewers
petri dishes
camera
live insect such as a caterpillar (optional)
DVD/video player (optional)
television (optional)

Books & Other Media

Bugs Don't Bug Us! video/DVD
About Insects by Cathryn Sill
About Arachnids by Cathryn Sill
Aaaarrgghh! Spider! by Lydia Monks
Insects Are My Life by Megan McDonald
Be Nice to Spiders by Margaret Bloy Graham
My Father's Hands by Joanne Ryder
Songs about Insects, Bugs and Squiggly Things CD by Jane Murphy

Vocabulary

afraid
alive
gentle
insect
living
spider

Approach

In advance, search your playground for areas you are likely to find insects. Let families know that their children are going to be learning about insects. Ask about any fears or allergies. If you are using the *Bugs Don't Bug Us!* video, set up the video player and TV and cue to the portion you want to show the children.

Begin by showing the children the large insect and spider models. Ask: *What are these? Where have you seen them? What do you do when you see them?*

Using the insect models or a live insect, demonstrate the appropriate way to interact with insects. Or, show a portion of the *Bugs Don't Bug Us!* video. Draw the children's attention to how the children in the video interact with the insects.

Go outdoors and search for insects and spiders. Model how to use the specimen viewers and petri dishes to gently capture specimens for more careful examination. Take photos of insects or spiders that you see. Let the animals go when you are done looking at them.

Science Center
Place the models in the Center for further examination.

Integrated Experiences

Literacy 1: During the conversation, write down the words and phrases the children use to describe insects and spiders. Add to your word wall. Compare them to the words and phrases the children use as you conclude your insect and spider study.

Literacy 2: Begin a class log tracking the different insects and spiders found each day. Illustrate with photos or children's drawings.

Math: Count and graph the number of insects and spiders that you see each day.

Creative Arts 1 (Music and Movement): Listen to the song "I Love Bugs" on the *Songs about Insects, Bugs and Squiggly Things* CD.

Creative Arts 2 (Art): Draw a large empty jar on paper and make a copy for each child. Have the children draw their favorite insects in the jar. Cut out the jars and glue them on construction paper.

Social and Emotional: Discuss the fact that people are sometimes afraid of insects and spiders. Talk about how to help people who are afraid of insects and spiders.

Experience 2

What Is an Insect?

Science Concepts

There are many different kinds of insects and spiders.

Insects and spiders have distinctive features that help us identify them.

Aim

Children will learn the characteristics shared by all insects.

Materials

simple poster or illustration showing the parts of a insect
large rubber insect models
insect plastomounts
magnifying tools
dead insects
specimen viewers
petri dishes

Books & Other Media

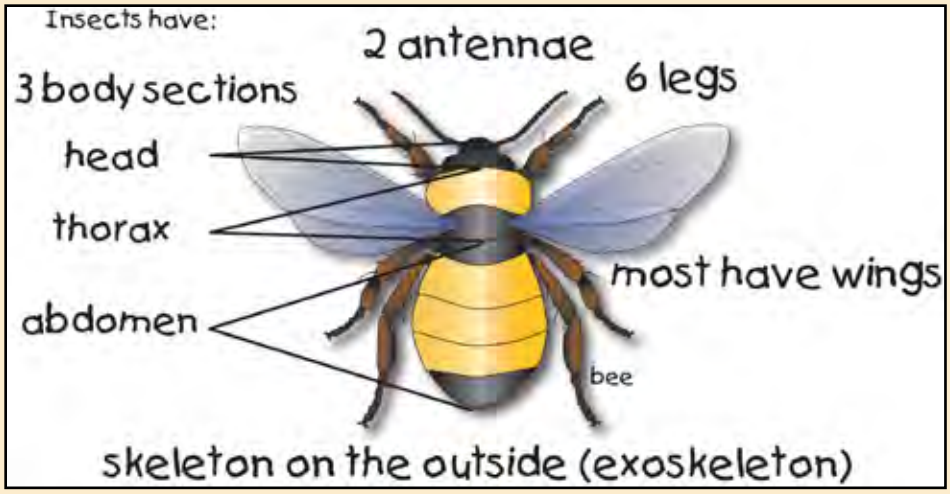
About Insects by Cathryn Sill
Bugs Are Insects by Anne Rockwell
Insects by Robin Bernard

Vocabulary

antenna
head
insect names (e.g., ant, butterfly, cricket)

Approach

- In advance, collect some dead insects. Store them in specimen viewers or petri dishes for viewing. Review the poster, models, and plastomounts so that you can direct the children's attention to the important features of insects.
- Show the children the large insect models. Introduce the names of the different insects.
- Encourage the children to describe the insects: *What color is it? Does it have wings? How many legs does it have?*
- Explain that all of the models are insects. Use the poster and talk about how all insects have 6 legs and 3 body parts.
- Show the children the insect plastomounts. Identify the insects and have the children use magnifying tools to examine the body parts.



Science Center

Place the insect models and any insects that you have collected, plus magnifying tools, in the Center for further examination.

Integrated Experiences

Literacy: Help the children describe their favorite insects using words and pictures in their journals.

Math: When examining the insect models, have the children count the number of legs, eyes, and other body parts the insects have.

Physical Health and Development (Fine Motor): ⚠ In advance, check for food allergies and complete necessary paperwork. Have the children make insects out of crackers, cream cheese or other spreads, pretzels, raisins, and dry cereal.

Experience 3

What Is a Spider?

Science Concept
Insects and spiders have distinctive features that help us identify them.

Aim
Children will learn the characteristics shared by all spiders.

Materials
large rubber spider and insect models
spider plastomount
simple poster or illustration showing the parts of a spider
magnifying tools

Books & Other Media
About Arachnids by Cathryn Sill
Spinning a Web by Lisa Trumbauer
Spiders by Nic Bishop
Are You a Spider? by Judy Allen
Aaaarrgghh! Spider! by Lydia Monks
The Very Busy Spider by Eric Carle
Songs about Insects, Bugs and Squiggly Things CD by Jane Murphy

Vocabulary
eight
eyes
legs
web

Approach
- In advance, review the model, plastomount, and poster or illustration so you can direct the children's attention to the important features of spiders.
- Using the insect models, review what the children have learned about insects.
- Direct the children's attention to the spider model. Encourage the children to describe how the spider differs from the insects: *How many legs does an insect have? Let's count to see how many legs the spider has. How many body parts does the spider have? How many body parts does an insect have? Which one has more?*

- Use a poster or illustration and talk about the features all spiders have in common.
- Have the children use magnifying tools to examine the plastomount spider.

Integrated Experiences

Literacy: Have the children draw a spider and label its parts.

Math 1: When examining the models and specimens, have the children count the number of legs, eyes, and other body parts they see.

Math 2: Review the chart where you have been recording the insects and spiders you see each day. Count the number of insects and spiders you have seen so far.

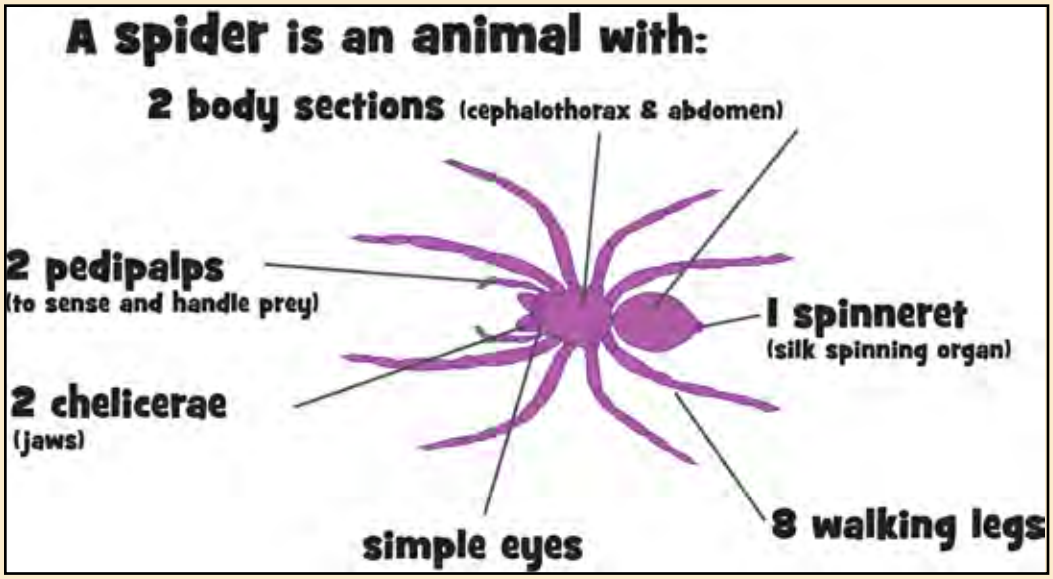
Creative Arts 1 (Art): Have the children make spiders out of pipe cleaners.

Creative Arts 2 (Music and Movement): Listen to the song “Spunky Spider” on the *Songs about Insects, Bugs and Squiggly Things* CD.

Creative Arts 3 (Music and Movement): Sing and perform “The Itsy Bitsy Spider.”

Social and Emotional: Many people are afraid of spiders. Show relevant portions of the *Bugs Don’t Bug Us!* video and talk with the children about why people are afraid of spiders and how spiders are helpful.

Physical Health and Development (Gross Motor): Have the children lie on their backs and lift themselves up on their hands and feet and scoot around like a spider.



Experience 4

Looking for Insects

Science Concept
There are many different kinds of insects and spiders.

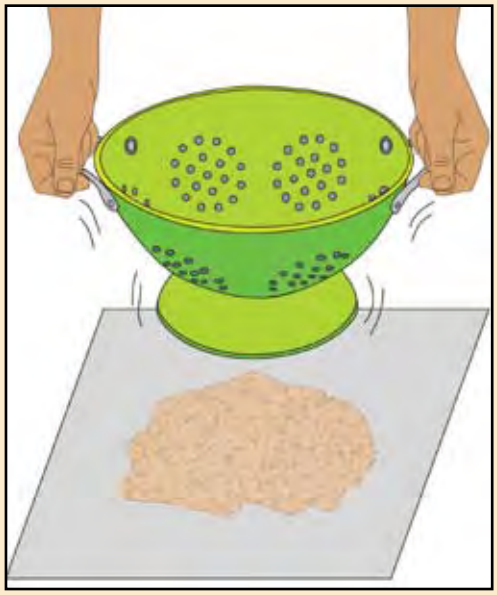
Aim
Children will learn that we can find a variety of insects in many places.

Materials
colander
shovel
white paper
small stones
plastic cup
tile
food scraps
magnifying tools
specimen viewers
camera

Books & Other Media
Bugs Are Insects by Anne Rockwell
UGH! A Bug by Mary Bono
Bug Safari by Bob Barner

Vocabulary
hidden
night
nocturnal
trap

Approach
Begin by asking the children to name some insects. Explain that there are many kinds of insects in the world, but they often are difficult to find. Encourage the children to share their ideas about where they are likely to find insects.



Try using different techniques to find insects. To find insects in the soil, shovel dirt into a colander. Gently shake over a sheet of white paper. Look for insects that you may have trapped in the colander and for smaller ones in the soil on the paper.

Or, set a large rock or other object (e.g., plant pot, bucket) on a patch of dirt. Leave it undisturbed. After a few days, carefully peak under it to see if there are any insects hiding.

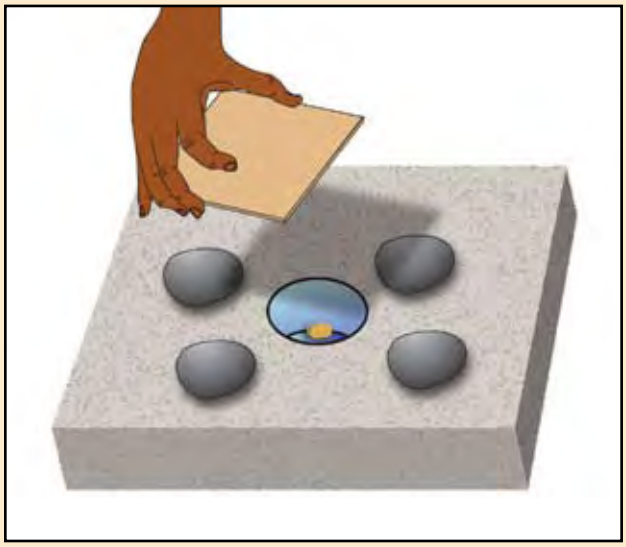
To collect insects that are active during the night, bury a plastic cup with some food scraps in the ground. Place a tile on a few stones above your trap.

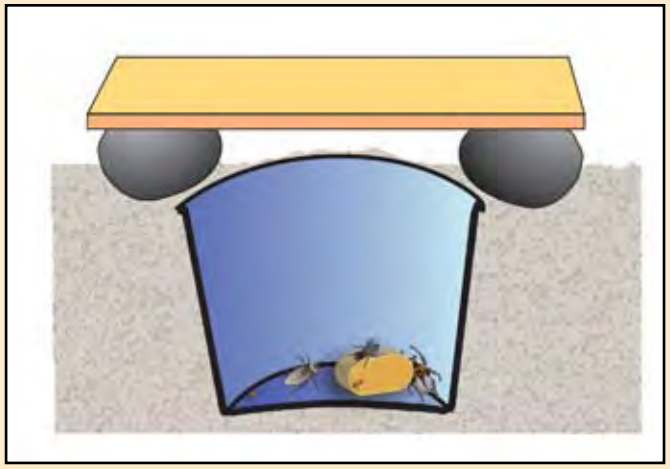
Extension

To further explore insects that are active at night, collect moths or fireflies in a specimen viewer to share with the children.

Science Center

Place any insects that you have collected, along with magnifying tools, in the Center for further examination. Release all live insects at the end of the day.





Experience 5

Metamorphosis

Science Concept
Insects and spiders grow and change during their life cycles.

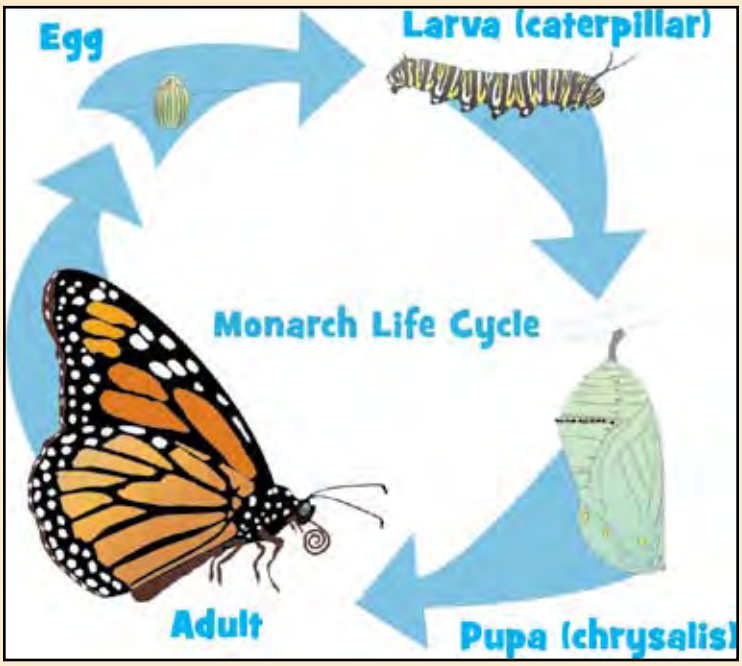
Aim
Children will learn about metamorphosis.

Materials
large rubber butterfly models
butterfly life cycle poster, puzzle, model, or card set

Books & Other Media
Caterpillar Caterpillar by Vivian French
A Ladybug's Life by John Himmelman
The Bumblebee Queen by April Pulley Sayre
A Luna Moth's Life by John Himmelman
Monarch Butterfly by Gail Gibbons
Songs about Insects, Bugs and Squiggly Things CD by Jane Murphy

Vocabulary
butterfly
caterpillar
chrysalis
egg
grow
larva
metamorphosis
pupa

Approach
- Show the children the butterfly models. Review what the children have already learned about insects. Ask them to identify the parts of the butterflies.
- Encourage the children to share their ideas about butterflies: *Where do we find butterflies? What do you think butterflies eat? Where do butterflies come from?*
- Using a book, explain how a butterfly changes and grows over its life cycle. Introduce the term "metamorphosis." Explain that all insects, not just butterflies, go through metamorphosis.
- Review the stages in the life cycle of a butterfly using a poster, puzzle, model, or card set.



Science Center
Place butterfly models and life cycle games or puzzles in the Center for guided exploration.

Integrated Experiences

Literacy: Have the children describe the life cycle of a butterfly in their journals using words and pictures.

Math: During the experience, have the children count the body parts of the butterflies.

Creative Arts 1 (Music and Movement): Listen to the song “Monarch Butterfly” on the *Songs about Insects, Bugs and Squiggly Things* CD.

Creative Arts 2 (Art): Have the children make caterpillars using sections from cardboard egg cartons. Decorate with markers, paint, and other materials.

Physical Health and Development (Fine Motor): ! In advance, check for food allergies and complete necessary paperwork. Have the children make caterpillar snacks out of celery or bread sticks coated with cream cheese and sprinkled with colored coconut or crushed cereal.

Experience 6

From Caterpillar to Butterfly

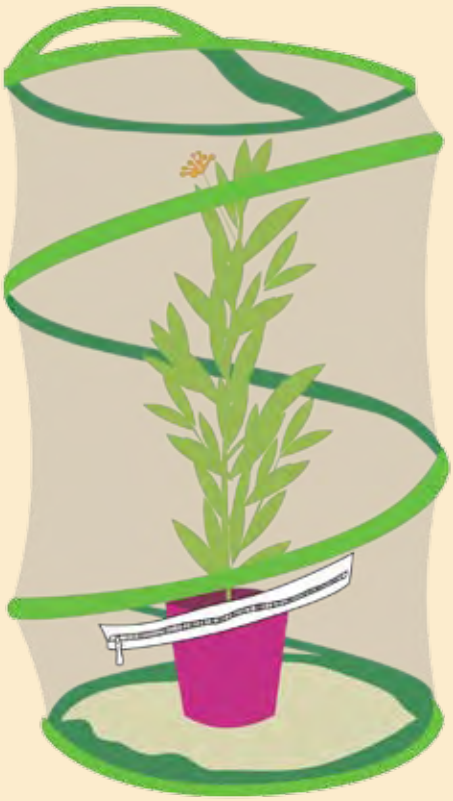
Science Concept
Insects and spiders grow and change during their life cycles.

Aim
Children will observe the changes that occur as a caterpillar grows into a butterfly.

Materials
butterfly larvae (caterpillars)
appropriate host plants
butterfly pavilion
paper towels
watering can
butterfly life cycle poster, puzzle, model, or card set
camera

Books & Other Media
Waiting for Wings by Lois Ehlert
Becoming Butterflies by Anne Rockwell
Are You a Butterfly? by Judy Allen
Where Butterflies Grow by Joanne Ryder
I'm a Caterpillar by Jean Marzollo

Vocabulary
butterfly
caterpillar
chrysalis
frass
grow
metamorphosis



Approach
- Weeks in advance, order butterfly larvae (caterpillars) and appropriate host plants from vendors. It is important that the plants have not been sprayed with insecticide, so tell your plant vendor that you are going to use the plants as larval food for caterpillars. Check your pavilion to make sure it is clean. Soak the pavilion in 10% bleach solution to decontaminate if needed.
- Show the children the caterpillars. Remind them about the importance of handling insects with care. Place the caterpillars in the pavilion. Draw the children's attention to the legs, antennae, eyes, and mouth. Talk about the colors of the caterpillars.
- Explain that the caterpillars hatched from eggs. Review with the children what is going to happen over the next few weeks: the caterpillar is going to eat and eat and eat, eliminate waste (frass), shed its skin,

Extension

Plant a butterfly garden on the school grounds or in a container.

Science Center

Place a butterfly life cycle puzzle, model, or card set in the Center. Help the children place the stages in correct sequence.

change into a chrysalis, and become a butterfly!

- Review the process of metamorphosis using a book, poster, model, or puzzle that shows the different stages.
- Each day, remove any frass that has accumulated. Check to see if your plant needs water.
- Throughout the experience, take photographs to document the stages in metamorphosis. Encourage the children to observe the caterpillars daily and describe the changes they see.
- When the butterflies emerge, give them time to rest and pump fluid into their wings before releasing them outdoors.

Hint!

The larvae (caterpillars) of different butterflies eat different kinds of leaves. For example, monarch caterpillars eat only milkweed. Be sure to research the kinds of plants your particular caterpillar will eat.

Experience 7

Insect Communication

Science Concept
Insects and spiders have distinctive characteristics that help us identify them.

Objective
Children will learn that different insects make different sounds to communicate.

Materials
recordings of insect sounds
corresponding insect photos
CD/tape player or computer

Books & Other Media
The Very Quiet Cricket by Eric Carle
Are You a Grasshopper? by Judy Allen
Songs about Insects, Bugs and Squiggly Things CD by Jane Murphy

Vocabulary
buzz
chirp
communicate
insect names (e.g., bee, cricket, grasshopper)

Approach
- In advance, find photos of insects that correspond to your insect sounds.
- Begin by reviewing what the children already know about the different ways animals "talk" to one another. Ask: *Have you ever heard an insect make a sound? Does a bee make a sound? What sound does a bee make?*
- Explain that different insects make sounds in different ways. Tell them that, to make sounds, mosquitoes and bees beat their wings, crickets and grasshoppers rub parts of their bodies together, and cicadas contract muscles in their abdomens.
- Play your recordings of insect sounds. Help the children match the insects photos to the sounds.

Extension
Go outdoors and listen for insect sounds.

Science Center
Place the insect photos in the Center for further exploration.

Integrated Experiences

Literacy: As a group, generate a list of words that describe the sounds insects make (buzz, hiss, chirp) and add them to a word wall.

Literacy: Have the children design a beehive and draw bees in the habitat.

Creative Arts 1 (Music and Movement): Listen and move to “The Bee Bop” on the *Songs about Insects, Bugs and Squiggly Things* CD.

Creative Arts 2 (Music and Movement): Have the children make up their own bee dance.

Creative Arts 3 (Art): Using ink pads or paint, have each child press an index finger on a sheet of white paper. Make several fingerprints across the paper. With a fine felt-tipped marker, add wings, antennae, and legs to make bumblebees. Other insects and spiders also can be made with fingerprints.

Social and Emotional: Invite a beekeeper to visit the classroom to explain how honey bees communicate.

Experience 8

Introduction to Ants

Science Concept
Insects and spiders have distinctive characteristics that help us identify them.

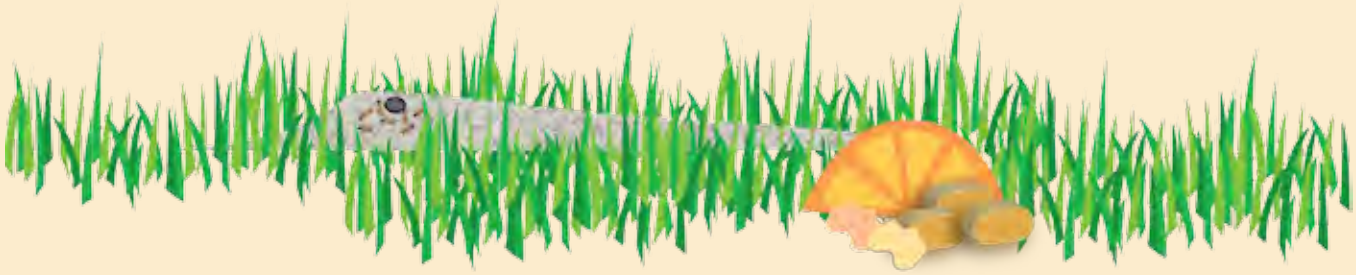
Aim
Children will observe ants.

Materials
simple poster or illustration showing the parts of an insect
ant model
camera
ant hill
food scraps
specimen viewer

Books & Other Media
Thinking about Ants by Barbara Brenner
The World of Ants by Melvin Berger
Are You an Ant? by Judy Allen
Bug Safari by Bob Barner
Songs about Insects, Bugs and Squiggly Things CD by Jane Murphy

Vocabulary
ant
ant hill

Approach
- In advance, search for an ant hill to observe. If you cannot find one, place food scraps in a safe spot to see if you can lure ants to the site.
- Using the poster, review what the children already have learned about insects. Show the children the large ant model. Encourage the children to share what they know about ants.
- Go outdoors and look for ants. Take the camera to document what you see. When you find some ants, put some food scraps on the ground nearby and watch what the ants do.
- Return to the same location later and observe whether the ant activity has changed.



Extension
Set up an ant farm in the classroom.

Science Center
Place an ant in a specimen viewer to allow the children to take a closer look. Secure the lid with tape.

Integrated Experiences

Literacy: Have the children draw an ant. Help them label the body parts.

Math 1: During your investigation, try to count the number of ants that you spot or the number of ant hills.

Math 2: Draw a simple map of your school yard and mark the locations where you found ant hills.

Creative Arts 1 (Art): Using ink pads or paint, have the children make thumbprint ants by connecting three thumbprints on a piece of paper and adding legs and antennae with a crayon.

Creative Arts 2: (Music and Movement). Listen to the song “Ants on Parade” from the *Songs about Insects, Bugs and Squiggly Things* CD.

Creative Arts 3 (Music and Movement): Sing “The Ants Go Marching.”

Creative Arts 4 (Dramatic Play): Set up a picnic using plastic food and other props in the dramatic play area and encourage the children to pretend to be ants taking the food back to their nest.

Experience 9

Investigating Ants I

Science Concept
Insects and spiders have distinctive characteristics that help us identify them.

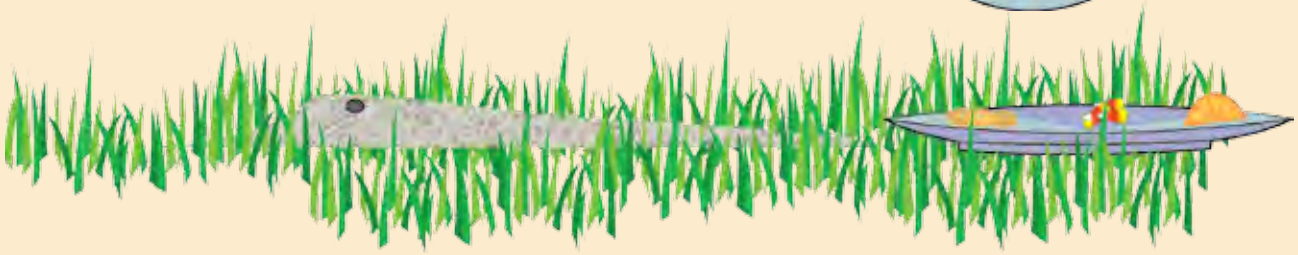
Aim
Children will participate in a simple investigation of ants.

Materials
ant hill
food scraps
paper plate
marker
camera
small insect models

Books & Other Media
Thinking about Ants by Barbara Brenner
The World of Ants by Melvin Berger
What Is a Scientist? by Barbara Lehn

Vocabulary
investigate

Approach
- Begin by reviewing what the children already have learned about ants. Ask: *Where do we find ants? What do ants eat?*
- Explain that the children are going to investigate what kinds of food ants like best. Using a marker, divide a paper plate into sections. Label each section with words and pictures. Place foods in the corresponding sections.
- Encourage the children to predict which foods the ants will prefer by asking questions such as: *Do you think the ants will like the apple or the cheese? Why?* Place the plate near an ant hill and watch what happens.
- Take photographs to document the investigation.
- Return later in the day to retrieve the plate. Compare the amount of each type of food that remains. Talk about whether the children's predictions were correct.



Extension

Further explore what ants like to eat by comparing other foods or repeating the investigation with another kind of ant.

Science Center

Place the small insect models in the Center for the children to sort.

Integrated Experiences

Literacy: Help the children describe the investigation in their journals using words and pictures, or create a class log.

Math: Compare the amount of food at the beginning and end of the investigation using words such as “more,” “less,” “fewer,” and “half.”

Physical Health and Development 1 (Health): Discuss why it is important to clean up after snacks and meals in order to keep ants out of eating areas.

Physical Health and Development 2 (Fine Motor): ⚠ In advance, check for food allergies and complete necessary paperwork. Have the children make “ants on a log” using celery, cream cheese, and raisins.

Experience 10

Investigating Ants 2

Science Concept
Insects and spiders have adaptations that help them survive.

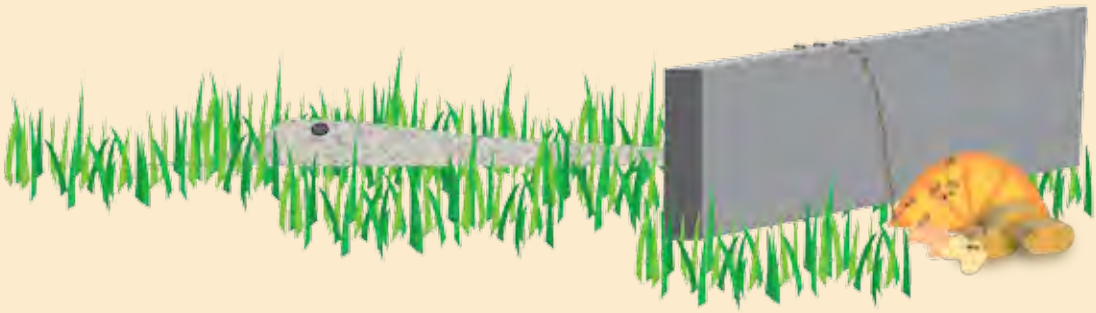
Aim
Children will further investigate ants.

Materials
ant hill
food scraps
block or other obstacle
camera
small insect models

Books & Other Media
Thinking about Ants by Barbara Brenner
The World of Ants by Melvin Berger
What Is a Scientist by Barbara Lehn

Vocabulary
around
climb
dig
obstacle
over
under

Approach
- Begin by reviewing the results of your investigation of what ants like to eat.



- Explain that it would be interesting to also investigate how ants find their food. For example, how do ants deal with obstacles or barriers that are between them and the food?
- Go outdoors and set up the investigation by placing your obstacle between some food that you know the ants eat and the ant hill. Encourage the children to think about what will happen by asking: *Do you think the ants will find the food? Do you think they will climb over the obstacle, dig under it, or go around it? Why do you think that?*
- Allow some time for the ants to sense the food. Observe what happens. Take photos so you can review the investigation later.

Extension

Investigate other questions such as what ants do when faced with large vs. small pieces of food.

Science Center

Place the small insect models in the Center for the children to sort.

Integrated Experiences

Literacy: Create a class display that describes the results of your investigation.

Math: Graph children's predictions about whether the ants would go over, under, or around the obstacle.

Physical Health and Development 1 (Large Motor): Make an obstacle course on the playground or indoors and have the children move through it like ants.

Experience 11

Insect Vision

Science Concept
Insects and spiders have adaptations that help them survive.

Aim
Children will learn that insects see things differently than people do.

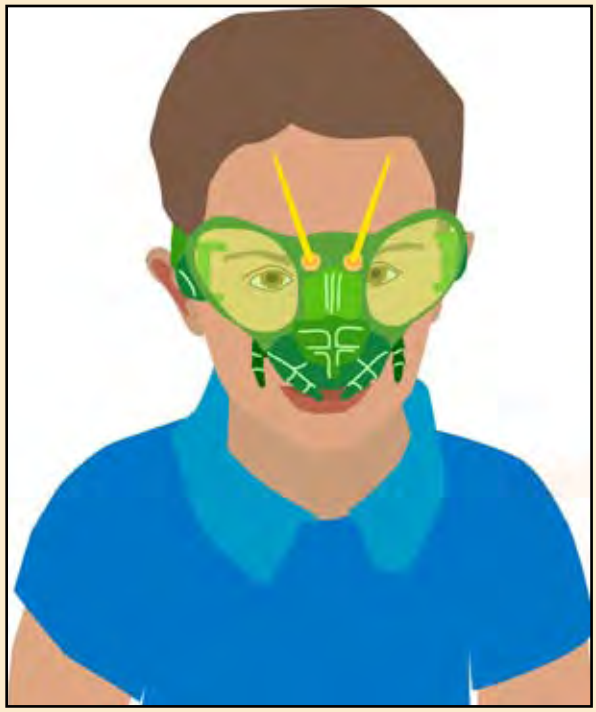
Materials
simple poster or illustration showing the parts of an insect
insect glasses
dragonfly model

Books & Other Media
Bug Faces by Darlyne A. Murawski
Are You a Dragonfly? by Judy Allen

Vocabulary
compound eyes
far
near

Approach
In advance, explore the insect glasses so that you can effectively guide the children's use of this item. Gather photos of insect eyes.

Use the poster and large dragonfly model to review with the children what they have already learned about the body parts of insects.

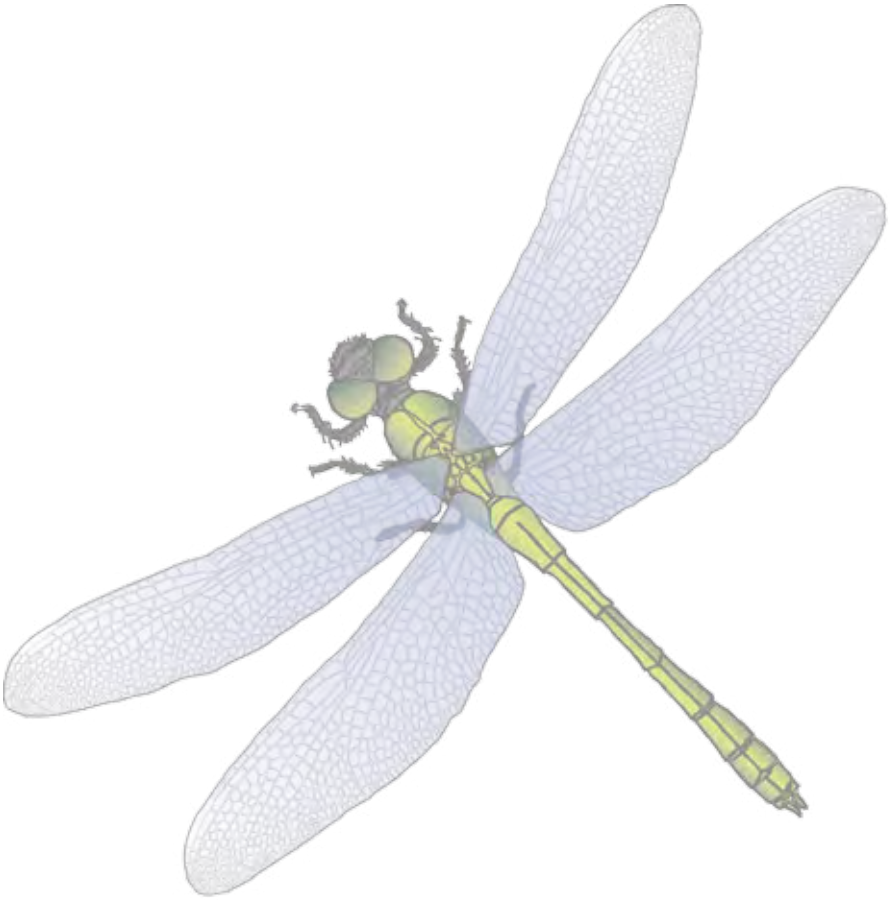


Show the children the photos of insect eyes. Introduce the term "compound eyes." Explain that insect eyes are different than human eyes. When we look at something, we see one of the thing. When insects look at something, they see many of that same thing.

Have the children take turns looking through the insect glasses to experience what insects see. Ask them to look at something far away. Explain that compound eyes make it very difficult to see things that are far away, but easier to spot something moving nearby.

Science Center

Place the insect glasses in the Center for further exploration.



Experience 12

Camouflage

Science Concept
Insects and spiders have adaptations that help them survive.

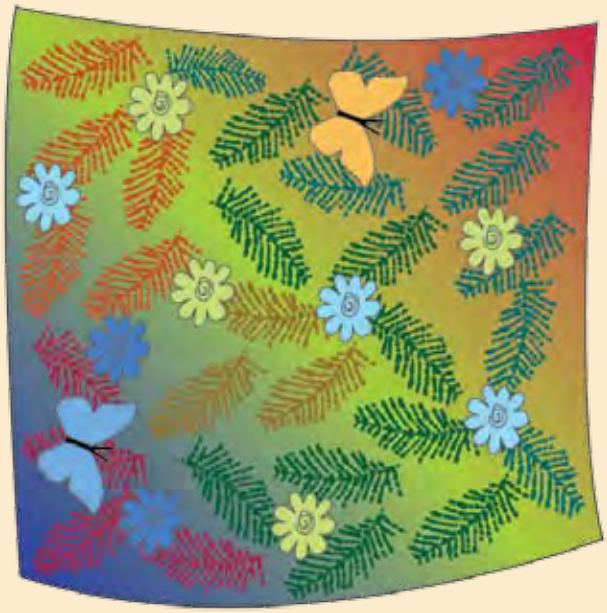
Aim
Children will explore camouflage.

Materials
plastic/rubber butterfly collection
colorful patterned paper or fabric

Books & Other Media
How to Hide a Butterfly and Other Insects by Ruth Heller
Insects by Robin Bernard
Animals in Hiding by Melvin Berger

Vocabulary
blend
camouflage
hide
predator
prey

Approach
Begin by talking about the fact that insects and spiders are eaten by many animals, including other insects, birds, and frogs. Ask the children to suggest ways an insect or spider could keep from being eaten.



Then help the children think about how an insect or spider could hide itself. Review the concept of camouflage. Explain that one way an insect or spider hides is by blending in with the things around it.

To illustrate, have the children "hide" the butterflies on colorful fabric/paper. Talk about how it is hard to see the butterflies when they are the same color as the fabric/paper, but that it is easy to spot those that are a different color.

Extension 1

Go outdoors on an insect/spider hunt with camouflage in mind. Look for green insects in the grass or on leaves and brown insects and spiders on tree trunks.

Science Center

Place the butterflies and fabric or patterned paper in the Center for the children to further explore camouflage.

Extension 2

Use the insect and spider models and plastomounts to discuss how animals can use teeth, pincers, or poison to protect themselves.

Integrated Experiences

Creative Arts 1 (Art): Cover a bulletin board with brightly colored wrapping paper or create a garden scene using construction paper. Have the children make their own insects and spiders out of paper and “hide” them on the bulletin board.

Creative Arts 2 (Art): Have the children create insects using natural materials such as sticks and leaves; brown, black, and green pipe cleaners; and paper. Explore the best places to hide the insects outdoors.

MESS® Take-Home Kit Information/Experience Card

Animals 2

Welcome to the Animals 2: Insects and Spiders *MESS*® Take-Home Kit. This page suggests ways to further explore what your child has been learning at school.

In this Kit you will find:

- *About Insects* by Cathryn Sill

This book explains basic facts about insects.

- Lady Beetle Life Cycle Set

This month, your child is learning that:

- there are many different kinds of insects.
- we can identify types of insects by their features.
- all insects go through several changes before becoming adults.

How to use this book:

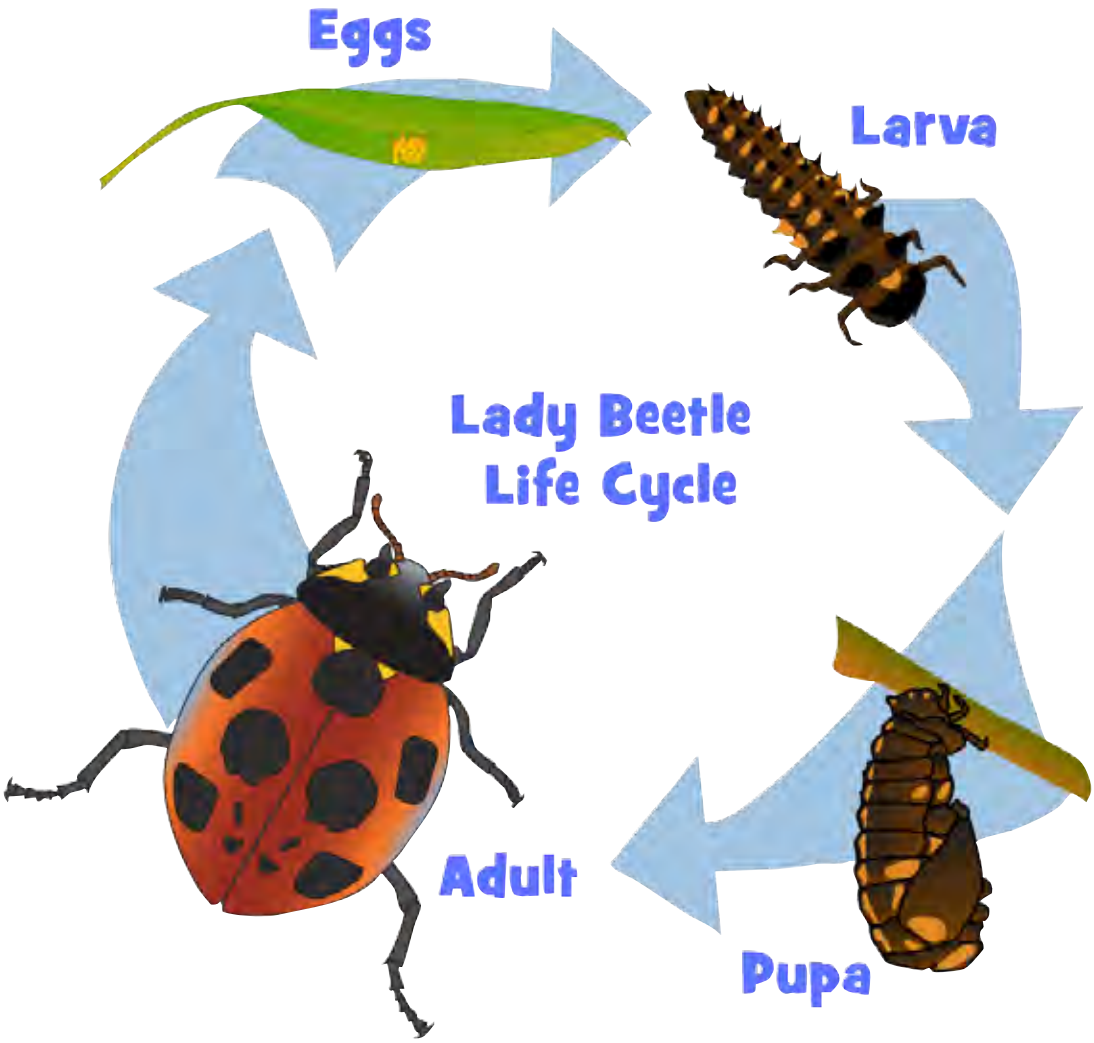
- As you read the book, encourage your child to look carefully at the pictures. Help your child find and name the legs, antennae, eyes, and wings on each insect.
- Encourage your child to watch for the page with the lady beetle.

How to use the objects:

- Use the objects and the drawing on the back of this sheet to explain the stages in the life cycle of the lady beetle.
- Encourage your child to place the egg, larva, pupa, and adult beetle in correct order.

To further support your child's learning:

- Go outdoors and look for lady beetles. They eat aphids and other small insects so you can often find them on plants that have not been sprayed with insecticides.
- Look for the eggs, larva (caterpillars), and pupa (chrysalis) of butterflies, moths, and other common insects on the leaves and stems of plants.


Eggs
Larva
Lady Beetle
Life Cycle
Adult
Pupa

Animals 2

Recommended Books

Allen, Judy. *Are You an Ant (*also *Bee, Butterfly, Grasshopper, Spider)* New York: Kingfisher, 2000-2002. The books in this series (Backyard Books) are packed with basic science information and detailed watercolor illustrations. Each title covers a particular animal's life cycle, feeding habits, natural enemies, and unique physical and behavioral characteristics. The text engages readers by encouraging comparisons between themselves and the animals, though sometimes human thoughts and emotions are attributed to animals.

Barner, Bob. *Bug Safari*. New York: Holiday House, 2006. A little boy, with magnifying glass in hand, has an adventurous trip following ants on their way to a backyard picnic. Information is accurate; bold, enlarged pictures add to the mystery. Additional information about the animals encountered is included.

Berger, Melvin. *Animals in Hiding.* Northborough, MA: Sundance/Newbridge, 2007. While not a book about insects specifically, photographs show camouflaged animals in a variety of habitats. The photographs are accompanied by large text that asks leading questions and encourages observation and conversation.

Berger, Melvin. *The World of Ants.* New York: Newbridge, 1993. Wonderful photographs and simple, large-type text provide basic facts about ants, especially their homes and communication.

Bernard, Robin. *Insects*. Washington, DC: National Geographic Society, 1999. Fascinating close-up photographs show examples of body parts shared by many insects. The text details how insects use different body parts like legs and mouthparts.

Bishop, Nic. *Spiders*. New York: Scholastic, 2007. Do you need pictures of spider eyes? Close-up photographs include that and much more for a variety of spiders. The text is long for young children, but the fairly large print can be read selectively. The curious young child can explore the photos alone, or with someone who can add information from the text.

Bono, Mary. *UGH! A Bug*. NY: Walker, 2002. This is a lighthearted, rhyming tour through the "bugs" that frequently irritate people. The book ends with very positive messages: bugs are hard to avoid completely, most are not nasty, they are here to stay, generally people are trespassing in the bug's space (not vice versa), and bugs are happier when not in a jar. Teachers will need to redefine the term "bug" since worms are included.

Animals 2

Brenner, Barbara. *Thinking about Ants*. New York: MONDO Publishing, 1997. Beautifully detailed illustrations and simple text ask the question: “How would it be, to be an ant?” Readers are asked to consider how ants look, what they eat, what they should fear, where and how they live, and more.

Carle, Eric. *The Very Busy Spider*/*La araña muy ocupada.* New York: Philomel Books, 1984. A busy spider works all day to spin a web, despite numerous distractions from other farmyard residents. The tactile web-building is fascinating, and the book provides valuable observation and conversation practice. Scientific information is minimal.

Carle, Eric. *The Very Quiet Cricket*/*El grillo silencioso.* New York: Philomel Books, 1990. A young male cricket finally learns how to chirp when he meets a beautiful female cricket. This is a fun demonstration of insect communication. An author’s note prior to the title page includes specific cricket information.

Ehlert, Lois. *Waiting for Wings.* San Diego: Harcourt, 2001. Bold colors in cut-paper illustrations and simple rhyming text tell the story of the butterfly life cycle. Some basic butterfly information and flower identification conclude the book. The habits of different caterpillars/ butterflies and their host/nectar plants are covered in the end note.

French, Vivian. *Caterpillar Caterpillar*. Cambridge, MA: Candlewick Press, 1993. A wise grandfather shares his knowledge of caterpillars with his granddaughter. Soft, lightly colored pen-and-ink illustrations add to the wonder of metamorphosis, while additional facts in the margins provide more information for those who are interested.

Gibbons, Gail. *Monarch Butterfly.* New York: Holiday House, 1989. Thoroughly labeled illustrations (including pronunciations) accompany the text that describes the monarch butterfly’s life cycle, body parts, and behavior, including migration. The drama of the various changes from caterpillar to chrysalis to butterfly are evident, but the amount of detail may require selective reading for young children. Instructions on how to raise a monarch and a page of fun facts are included.

Graham, Margaret Bloy. *Be Nice to Spiders.* New York: HarperCollins, 1967. A zookeeper eventually learns that spiders can be beneficial. Donated to the zoo by a little boy who is no longer able to keep her as a pet, Helen makes the animals comfortable by enthusiastically eating flies around them. The fictional story encourages discussion about the value of spiders.

Heller, Ruth. *How to Hide a Butterfly and Other Insects*/*Cómo se esconde una mariposa y otros insectos.* New York: Grosset & Dunlap, 1992. A limited amount of rhyming text introduces camouflage and explains why it is useful. Clever illustrations show how insects camouflage themselves within their environments and challenge readers to find the hidden insects.

Animals 2

Himmelman, John. *A Ladybug's Life.* New York: Children's Press, 1998. The life cycle of a ladybug is explained with detailed color illustrations and sparse text. Background on ladybugs in general and the specific kind of ladybug illustrated is provided in an introductory note.

Himmelman, John. *A Luna Moth's Life.* New York: Children's Press, 1998. The life cycle of a luna moth is the main theme of this book, but other animals and conditions in the moth's world get attention too. Striking, detailed color illustrations add to the sparse text.

Lehn, Barbara. *What Is a Scientist?* Brookfield, CT: Millbrook Press, 1998. Simple text and color photographs describe how scientists work: questioning, observing, reporting, etc. Children demonstrate each of the tasks.

Marzollo, Jean. *I'm a Caterpillar*. New York: Scholastic, 1997. Simply told with minimal text, this is the story—from the caterpillar's point of view—of metamorphosis. Illustrations generally are simple, colorful paper cutouts, but interesting details (like a ladybug or a spider) draw one's attention, too. This beginning reader may stimulate both discussion and observation.

McDonald, Megan. *Insects Are My Life*. New York: Orchard Books, 1995. A little girl who is a devoted insect fan has a hard time dealing with her classmates. Good insect information (including the fact that worms are not insects) is included. The softly colored illustrations are detailed, down to the ants crawling on the kitchen floor and expressions on Amanda's face.

Monks, Lydia. *Aaaarrgghh! Spider!* Boston: Houghton Mifflin, 2004. Because it is really lonely being a spider, a spider tries to compare itself favorably to a family's other pets. Although the title seems negative, the story encourages a positive attitude toward spiders.

Murawski, Darlyne A. *Bug Faces*. Washington, DC: National Geographic Society, 2000. Colorful, detailed, and fascinating close-up photographs of insects, and a couple of their arachnid relatives, invite careful study. The whole book is like looking through a giant magnifier! Descriptive text (that can be read selectively for young children) and a funny headline explain the particulars of each photograph.

Rockwell, Anne. *Becoming Butterflies*. New York: Walker, 2002. There is nothing like the experience Miss Dana's students share when she brings three caterpillars and a milkweed plant into their classroom. Softly colored illustrations depict the children drawing each life stage and letting the butterflies go when they are ready for flight. Details about additional caterpillars/ butterflies are included. Society of School Librarians International Book Awards Honor Book 2002 Science-Grades K-6

Animals 2

Rockwell, Anne. *Bugs Are Insects.* New York: HarperCollins, 2001. Illustrated with realistic and creative paper cutouts, this informative book begins with a discussion of the common insect characteristics, then describes some ways in which insects can differ from one another. Discussion of true bugs and comparisons to spiders and other non-insect external skeletons are helpful. Text is appropriate for young children. A page of suggestions for finding out more about insects is included. 2002 NSTA Outstanding Trade Science Book K-12

Ryder, Joanne. *My Father's Hands*. New York: Morrow Junior Books, 1994. While not exclusively an insect or spider book, the beautiful pastel illustrations about a father and child working together in the garden encourage care, wonder, and observation of the living things they find. The text is full of descriptive words.

Ryder, Joanne. *Where Butterflies Grow.* New York: Lodestar Books, 1989. "Imagine you are someone small hidden in a tiny egg . . ." Thus begins a fascinating journey into a garden for a close look at a black swallowtail's world. Details abound in the full-page illustrations, and magnified boxes and hidden "extras" invite close observation. A resource page on growing butterflies in your own garden is included.

Sayre, April Pulley. *The Bumblebee Queen.* Watertown, MA: Charlesbridge, 2005. Appropriately limited text and finely detailed illustrations tell the story of a queen bee as she creates and tends her colony throughout the year. Informational asides in the margins add to the learning opportunities. Recommended books and web sites are listed.

Sill, Cathryn. *About Arachnids*. Atlanta: Peachtree Publishers, 2003. Fifteen detailed, close-up watercolor drawings with minimal text describe the basic physical features, life cycle, and behavior of arachnids (spiders, scorpions, ticks, mites, and harvestmen) and how they differ from insects. Illustrations invite close study. An afterword provides more details about each of the featured animals. 2004 NSTA Outstanding Science Trade Book K-12

Sill, Cathryn. *About Insects.* Atlanta: Peachtree Publishers, 2000. Eighteen beautiful, large, detailed illustrations and spare text provide basic information about insect anatomy, movement, and behavior. An afterword, with miniatures of the illustrations, provides additional information about the insects.

Trumbauer, Lisa. *Spinning a Web.* New York: Newbridge Educational Publishing, 1996. Wonderful close-up, color photographs and very simple text provide basic facts about the diverse world of spiders (what they look like, one way they differ from insects, where they live, and how they move) before focusing on their webs. Additional fun facts and things to think about are included.

Animals 2

Other Recommended Books

Amentrout, David, and Patricia. *50 Words about Insects*. Vero Beach, FL: Rourke Publishing, 2003. This mini-dictionary includes two words per page, plus relevant pictures for each. A pronunciation key, index, and bibliography are also provided. This volume is a nice introduction to reference books.

Back, Christine, and Barrie Watts.*Spider's Web*. Englewood Cliffs, NJ: Silver Burdett, 1984. Starting with a garden spider only (or so it looks), stark and fascinating photographs show a growing spider web. A single sentence, in larger type, explains what is happening. Additional smaller text and small black and white illustrations provide further information for readers who want more.

Berger, Melvin, and Gilda Berger. *How Do Flies Walk Upside Down?* New York: Scholastic, 1999. Do insects have tongues? How busy is a bee? Questions and answers about insects are accompanied by useful color illustrations. Questions are appropriate for children, but the brief answers may be incomplete and thus stimulate further discussion and research.

Brinckloe, Julie. *Fireflies!* New York: Aladdin Paperbacks, 1986. Soft, warm pictures tell the story of a boy who joins his friends outdoors to catch fireflies one evening. He sadly releases the fireflies as soon as he understands what happens if they are brought indoors in a jar.

Carle, Eric. *The Very Hungry Caterpillar/ La oruga muy hambrienta.* New York: Philomel Books, 1981. This childhood favorite effectively illustrates the voracious appetite of a growing caterpillar. Teachers can readily correct the scientific errors—most caterpillars do not make cocoons and no caterpillars eat such a diverse diet—and use the book as a starting point for a discussion about the importance of a healthy diet.

Carle, Eric. *The Very Clumsy Click Beetle.* New York: Philomel Books, 1999. The intriguing click beetle phenomenon of turning itself over provides an example of the value of practice and more practice. Discussion about beetle science is easily initiated.

Carle, Eric. *The Very Lonely Firefly.* New York: Philomel Books, 1995. Looking for others like himself, a single firefly unsuccessfully follows several sources of light. The illustrations are set at night, but the colors are bold and bright. An introductory note gives some brief firefly background. Is the firefly "lonely?" There are a number of things scientists do not know about the firefly; that may be one of them.

Cassie, Brian and Jerry Pallotta. *The Butterfly Alphabet Book.* Watertown, MA: Charlesbridge, 1995. At least one butterfly per letter, plus some general information (like S for scales), make this an informative book. Although too-much-text seems a drawback at first, many of the small facts can start discussion about some observation, or may be edited out in reading.

Animals 2

Cole, Joanna. S*pider's Lunch.* New York: Grosset and Dunlap, 1995. Clever close-up collages and simple language help the reader follow a garden spider's life: her web-building, eating, and reproduction. This book is a good companion to actually watching a spider and its web.

Coughlan, Cheryl. *Beetles.* Mankato, MN: Pebble Books, 1999. Vivid close-up photographs and sparse text explain what beetles look like and what they eat. Pebble's small-format insect series includes titles about ants, bumblebees, crickets, dragonflies, fireflies, flies, grasshoppers, ladybugs, and mosquitoes.

Fowler, Allan. *Inside an Ant Colony*. New York: Children's Press, 1998. This small-format book is packed with ant information. Fascinating, close-up photographs detail life in and around an ant colony. Text may need to be read selectively. A picture glossary and index are included.

Fowler, Allan. *It's a Good Thing There Are Insects/Qué bueno que haya insectos!* Chicago: Children's Press, 1990. "Sometimes we call them bugs. But their real name is insects." With that important clarification, close-up color photographs and a limited amount of text in this small-format book provide basic information about a variety of insects. Most important are the sections about positive and negative aspects of insects. In the end, insects are promoted as valuable to humankind.

Fowler, Allan. *Spiders Are Not Insects.* New York: Children's Press, 1996. Simple text and close-up photographs in small-book format provide basic spider information, including several useful spider-insect contrasts. A picture glossary and index are included.

Fredericks, Anthony D. *Under One Rock: Bugs, Slugs, and Other Ughs.* Nevada City, CA: Dawn Publications, 2001. What's under a rock on a warm summer day? A little boy discovers a whole community of amazing creatures in bright, colorful illustrations (although not proportionally sized) and a cumulative text. Because the repeated text becomes long, the book may need to be read selectively. The discussion possibilities are numerous. Field notes at the end provide brief facts about the worms, insects, spiders, millipedes, and slugs featured.

Ganeri, Anita. *From Egg to Spider*. Chicago: Heinemann Library, 2006. Close-up photographs are fascinating, even for non-spider lovers! The book may need to be read selectively to young children, but provides good information.

Hickman, Pamela. *A New Butterfly; My First Look at Metamorphosis*. Buffalo, NY: Kids Can Press, 1997. From her perch in a tree, Connie observes a butterfly laying eggs. The story follows their growth through the birth of a new butterfly. The life cycle story, soft illustrations, and fold-out pages are strengths of this small-format book.

Animals 2

Hoberman, Mary Ann. *The Eensy-Weensy Spider*. Boston: Little, Brown, 2000. Whether you are an "eensy-weensy" or "itsy-bitsy" fan, this fingerplay is a childhood classic. But following the waterspout washout, do you think the spider went up again immediately? According to this version, the spider had numerous additional adventures described in rhyming verses that can be sung to the music printed inside the cover. The six shoes and six band-aids can be the focus of scientific discussion about spiders.

Hoose, Phillip and Hannah. *Hey, Little Ant*. Berkeley, CA: Tricycle Press, 1998. This improbable, humorous, rhyming dialogue between a boy and an ant raises the issue of respect for all living things. In addition, teachers can draw attention to some ant science. The exaggerated illustrations also highlight the issues of bullying, peer pressure, and different points of view. Music and lyrics from the original song are included.

Keller, Holly. *Farfallina & Marcel*. New York: Greenwillow Books, 2002. A caterpillar and a gosling become friends. When the caterpillar seems to disappear (while becoming a chrysalis), the gosling goes on with his own, albeit less dramatic, changes. Appealing illustrations, mostly in blues and greens, support the age-appropriate text.

Lerner, Carol. *Butterflies in the Garden*. New York: HarperCollins, 2002. Beautiful illustrations of plants and butterflies encourage close observation. For the child who needs more, this book also is full of detailed but not-overwhelming text. For younger children, the pictures will suffice or text can be read selectively. 2003 NSTA Outstanding Science Trade Books for Students K–12

Ling, Mary. *Butterfly*. New York: Dorling Kindersley, 1992. As part of DK's See How They Grow series, this book shows the growth of a butterfly beginning as a tiny yellow egg. Text is appropriately limited while photos are isolated with little background. Artistic borders chart growth also. The type of butterfly is not identified.

London, Jonathan. *Dream Weaver*. San Diego: Silver Whistle, 1998. "If you're quiet . . . " and a curious child, you too might find a spider that you can look at so closely you feel pulled into its world. Vivid, dark, exaggerated illustrations and a hand-written text enhance the affect. A page of facts about spiders is included.

Lucas, David. *Halibut Jackson.* New York: Alfred A. Knopf. 2003. Shy Halibut Jackson rarely goes out, but when he does, he dresses to match his surroundings. This fanciful, non-insect story perfectly illustrates camouflage.

McDonald, Mary Ann. *Bees.* Chanhassen, MN: Child's World, 2003. Wonderful close-up photographs make this a fascinating book. The text (which must be read selectively for young children) describes what bees look like, where/how they live, what they eat, and why they are important.

Animals 2

Oppenheim, Shulamith Levey. *Fireflies for Nathan*. New York: Tambourine Books, 1994. Nathan's visit to his grandparents is the occasion for an expedition to view and catch fireflies. Appropriate behavior in catching and releasing insects is exhibited. Acrylic illustrations add to the warm familial feeling.

Pike, Norman. *The Peach Tree*. Owings Mills, MD: Stemmer House, 1983. Aphids are eating the new peach tree until Farmer Pomeroy brings in a family of ladybugs and the balance of nature is restored. The Pomeroy family especially appreciates this since they also enjoy the fruits of the tree.

Poole, Amy Lowry. *The Ant and the Grasshopper.* New York: Holiday House, 2000. A classic Aesop fable is retold, this time set in China and displayed beautifully in ink on rice paper. Hardworking ants prepare for winter while a grasshopper focuses on more short-term interests. This version is fun reading and viewing, though long on moral (playing all the time has consequences) and short on insect science.

Posada, Mia. *Ladybugs: Red, Fiery, and Bright.* Minneapolis: Carolrhoda Books, 2002. With colorful illustrations and rhyming text (sometimes a bit forced), this book depicts the life cycle of an insect especially helpful to humans. Interesting details, including the orange liquid oozed from their legs, are provided in a concluding "More about Ladybugs" section. Society of School Librarians International Book Awards 2002 Science-Grades K-6

Rockwell, Anne. *Bumblebee, Bumblebee, Do You Know Me?* New York: HarperCollins, 1999. Riddles are fun and the logic between insects (and one spider) and flowers is strong, so why not connect the two? The bold colors in the isolated silkscreen illustrations (no backgrounds) make it easy for teachers to point out the science.

Ryden, Hope. *The ABC of Crawlers and Flyers*. New York: Clarion Books, 1996. The text in this book is more than ample for young children, but the detailed photographs make it a good teacher and class resource. Some children will appreciate the additional information.

Simon, Seymour. *Big Bugs*. San Francisco: SeaStar Books, 2005. Close-up photographs are riveting and will appeal especially to the curious and observant. "Actual size" diagrams are added for some animals. Text is generally appropriate for young children. Be aware that "bug" is defined in the beginning to include non-insect arthropods, such as scorpions and spiders.

Sturges, Philemon. *Ten Flashing Fireflies*. New York: North-South Books, 1995. Playing outside when the fireflies are out and "catchable" is exciting. Watching for other things in these dark illustrations is also rewarding. However, watching firefly lights go out when you take them inside is a disappointment. Joy comes again in seeing them "fly out the window and flash good-bye."

Animals 2

Swope, Sam. *Gotta Go! Gotta Go!* New York: Farrar, Straus and Giroux, 2000. Gotta go where? This "creepy crawly bug," really a monarch caterpillar that emerges from an egg, somehow knows the answer is Mexico. The insects it encounters want to know what and where Mexico is and how to get there, but instinct is all the caterpillar can rely on for the migration to Mexico. Gently colored illustrations are simple but accurate, and the repetitive refrain is fun for young children.

Theodorou, Rod. *Insects*. Chicago: Heinemann Library, 2007. Fascinating close-up photographs emphasize young insects and their care. The book could be read selectively with photograph labels and/or used as a teacher reference. A useful chart comparing insects and other animal groups is included.

Trumbauer, Lisa. *The Life Cycle of a Bee.* Mankato, MN: Pebble Books, 2003. In small-book format, simple text and close-up color photographs tell the story of a bee's life cycle. Pebble's Life Cycle series includes titles about a butterfly and several non-insect animals also.

Tyson, Leigh Ann. *An Interview with Harry the Tarantula*. Washington, DC: National Geogaphic Society, 2003. Katy Did's KBUG radio program has Harry Spyder as its guest today to talk about his scary adventure with a little girl and an empty bottle. "Listeners" learn lots about tarantulas during the Q & A format. Cartoonish illustrations add to the fun. The story may be long for young children, but can be read in segments.

Watts, Barrie. *Butterfly and Caterpillar*. Morristown, NJ: Silver Burdett, 1986. Detailed photographs, accompanied by black-and-white line drawings, show butterfly growth from egg to adult. The extensive text is in two type sizes and can easily be read selectively. The directed text ("look at the caterpillar's legs") and the built-in questions ("can you see . . . ?") make this a lap book to be shared with the curious young child who is fascinated by insects.

Winer, Yvonne. *Spiders Spin Webs*. Watertown, MA: Charlesbridge, 1996. The how, when, where, and why of spider web-building are told in one short poem and a stand-alone spider illustration on one page and another illustration, on the next page, of that spider in its habitat. Illustrations invite close observation and generate conversation. An informative guide to the featured spiders is included.

Other Recommended Media

Bugs Don't Bug Us! (DVD or video). Eureka Montana. Bo Peep Productions, 1991. A diverse group of young children interact comfortably with insects, spiders, and other invertebrates. Up-close footage of the small creatures moving and eating is included. One segment shows butterfly metamorphosis. 35 minutes.

Animals 2

Murphy, Jane Lawliss. *Songs about Insects, Bugs and Squiggly Things* (compact disc). Kimbo Educational Audio, 1993. This CD has 14 upbeat songs on a variety of insects, spiders, and related topics such as metamorphosis. The songs promote a positive attitude toward insects and other creepy crawlies. Lyrics are included.

Head Start Domains and Indicators Associated with Core and Center Experiences

Domain & Indicators	Experience												
Language Development	1	2	3	4	5	6	7	8	9	10	11	12	T-H
Demonstrates increasing ability to attend to and understand conversations, stories, songs, poems.	•	•	•	•	•	•	•	•	•	•	•	•	•
Shows progress in understanding and following simple and multi-step directions.	•	•	•	•	•	•	•	•	•	•	•	•	•
Understands an increasingly complex and varied vocabulary.	•	•	•	•	•	•	•	•	•	•	•	•	•
For Non-English speaking children, progresses in listening to and understanding English.	•	•	•	•	•	•	•	•	•	•	•	•	•
Develops increasing abilities to understand and use language to communicate information, experiences, ideas, feelings, opinions, needs, questions, and for other varied purposes.	•	•	•	•	•	•	•	•	•	•	•	•	•
Progresses in abilities to imitate and respond appropriately in conversation and discussions with peers and adults.	•	•	•	•	•	•	•	•	•	•	•	•	•
Uses an increasingly complex and varied spoken vocabulary.	•	•	•	•	•	•	•	•	•	•	•	•	•
Progresses in clarity of pronunciation and towards speaking in sentences of increasing length and grammatical complexity.	•	•	•	•	•	•	•	•	•	•	•	•	•
For Non-English speaking children, progresses in speaking English.	•	•	•	•	•	•	•	•	•	•	•	•	•
LITERACY													
Shows increasing ability to discriminate and identify sounds in spoken language.													
Shows growing awareness of the beginning and ending sounds of words.													
Progresses in recognizing matching sounds and rhymes in familiar words, games, songs, stories and poems.													
Shows growing ability to hear and discriminate separate syllables in words.													

Head Start Domains and Indicators Associated with Core and Center Experiences

Domain & Indicators	Experience												
LITERACY CONTINUED	1	2	3	4	5	6	7	8	9	10	11	12	T-H
Associates sounds with written words, such as awareness that different words begin with the same sound.													
Shows growing interest and involvement in listening to and discussing a variety of fiction and nonfiction books and poetry.													•
Shows a growing interest in reading-related activities, such as asking to have a favorite book read; choosing to look at books; drawing pictures based on stories; asking to take books home; going to the library; and engaging in pretend-reading with other children.													•
Demonstrates progress in abilities to retell and dictate stories, to act out stories, and to predict what will happen next in a story.													•
Progresses in learning how to handle and care for books; knowing to view one page at a time in sequence from front to back; and understanding that a book has a title, author and illustrator.													•
Shows increasing awareness of print in classroom, home and community settings.		•	•	•	•	•			•		•		
Develops growing understanding of the different functions of forms or print such as signs, letters, newspapers, lists, messages, and menus.		•	•	•	•	•			•		•		
Demonstrates increasing awareness of concepts of print, such as that reading in English moves from top to bottom and from left to right, that speech can be written down, and that print conveys a message.		•	•	•	•	•			•		•		•
Shows progress in recognizing the association between spoken and written words by following print as it is read aloud.		•	•	•	•	•			•		•		•
Recognizes a word as a unit of print, or awareness that letters are grouped to form words, and that words are separated by spaces.		•	•	•	•	•			•		•		•
Develops understanding that writing is a way of communicating for a variety of purposes.													

Head Start Domains and Indicators Associated with Core and Center Experiences

Domain & Indicators	Experience												
LITERACY CONTINUED	1	2	3	4	5	6	7	8	9	10	11	12	T-H
Begins to represent stories and experiences through pictures, dictation, and in play.													
Experiments with a growing variety of writing tools and materials, such as pencils, crayons, and computers.													
Progresses from using scribbles, shapes, or pictures to represent ideas, to using letter-like symbols, to copying or writing familiar words such as their own name.													
Shows progress in associating the names of letters with their shapes and sounds.													
Increases in ability to notice the beginning letters in familiar words.													
Identifies at least 10 letters of the alphabet, especially those in their own name.													
Knows the letters of the alphabet are a special category of visual graphics than can be individually named.													
MATHEMATICS													
Demonstrates increasing interest and awareness of numbers and counting as a means of solving problems and determining quantity.		•	•					•					
Begins to associate number concepts, vocabulary, quantities, and written numerals in meaningful ways.		•	•										
Develops increasing ability to count in sequence to 10 and beyond.									•	•			
Begins to make use of one-to-one correspondence in counting objects and in matching groups of objects.		•	•					•	•	•			
Begins to use language to compare numbers of objects with terms such as more, less, greater than, fewer, equal to.			•						•	•			
Develops increased abilities to combine, separate and name “how many” concrete objects.									•	•			

Head Start Domains and Indicators Associated with Core and Center Experiences

Domain & Indicators	Experience												
MATHEMATICS CONTINUED	1	2	3	4	5	6	7	8	9	10	11	12	T-H
Begins to recognize, describe, compare, and name common shapes, their parts and attributes.			•						•	•			
Progresses in ability to put together and take apart shapes.													
Begins to be able to determine whether or not two shapes are the same size and shape.			•						•	•			
Shows growth in matching, sorting according to 1 or 2 attributes such as color, shape or size.			•						•	•			
Builds an increasing understanding of directionality, order and positions of objects, and words such as up, down, over, under, top, bottom, inside, outside, in front, and behind.	•	•	•	•	•	•		•	•	•	•		•
Enhances abilities to recognize, duplicate and extend simple patterns using a variety of materials.													
Shows increasing abilities to match, sort, put in a series, and regroup objects according to one or two attributes such as shape or size.									•	•			
Begins to make comparisons between several objects based on a single attribute.			•						•	•			
Shows progress in using standard and no-standard measures for length and area of objects.													
SCIENCE													
Begins to use senses and a variety of tools and simple measuring devices to gather information, investigate materials, and observe processes and relationships.	•	•	•	•	•	•	•	•	•	•	•	•	•
Develops increased ability to observe and discuss common properties, differences and comparisons among objects and materials.	•	•	•	•	•	•	•	•	•	•	•	•	•
Begins to participate in simple investigations to test observations, discuss and draw conclusions and form generalizations.	•	•	•	•	•	•	•	•	•	•	•	•	•
Develops growing abilities to collect, describe and record information through a variety of means, including discussion, drawings, maps and charts	•	•	•	•	•	•	•	•	•	•	•	•	•

Head Start Domains and Indicators Associated with Core and Center Experiences

Domain & Indicators	Experience												
SCIENCE CONTINUED	1	2	3	4	5	6	7	8	9	10	11	12	T-H
Begins to describe and discuss predictions, explanations, and generalizations based on past experiences.	•	•	•	•	•	•	•	•	•	•	•	•	•
Expands knowledge of and abilities to observe, describe and discuss the natural world, materials, living things, and natural processes.	•	•	•	•	•	•	•	•	•	•	•	•	•
Expands knowledge of and respect for their body and the environment.	•	•	•	•	•	•	•	•	•	•	•	•	•
Develops growing awareness of ideas and language related to attributes of time and temperature.				•		•		•	•	•			
Shows increased awareness and beginning understanding of changes in materials and cause-effect relationships.				•		•		•	•	•			
CREATIVE ARTS													
Participates with increasing interest and enjoyment in a variety of music activities, including listening, singing, finger plays, games, and performances.													
Experiments with a variety of musical instruments.													
Gains ability in using different art media and materials in a variety of ways for creative expression and representation.													
Progresses in abilities to create drawings, paintings, models, and other art creations that are more detailed, creative or realistic.													
Develops growing abilities to plan, work independently, and demonstrate care and persistence in a variety of art projects.													
Begins to understand and share opinions about artistic products and experiences.													
Expresses through movement and dancing what is felt and heard in various musical tempos and styles.													
Shows growth in moving in time to different patterns of beat and rhythm in music.													

Head Start Domains and Indicators Associated with Core and Center Experiences

Domain & Indicators	Experience												
CREATIVE ARTS CONTINUED	1	2	3	4	5	6	7	8	9	10	11	12	T-H
Participates in a variety of dramatic play activities that become more extended and complex.													
Shows growing creativity and imagination in using materials and in assuming different roles in dramatic play situations.													
SOCIAL & EMOTIONAL DEVELOPMENT													
Begins to develop and express awareness of self in terms of specific abilities, characteristics and preferences.	•	•	•	•	•	•	•	•	•	•	•	•	•
Develops growing capacity for independence in a range of activities, routines, and tasks.	•	•	•	•	•	•	•	•	•	•	•	•	•
Demonstrates growing confidence in a range of abilities and expresses pride in accomplishments.	•	•	•	•	•	•	•	•	•	•	•	•	•
Shows progress in expressing feelings, needs and opinions in difficult situations and conflicts without harming themselves, others, or property.	•	•	•	•	•	•	•	•	•	•	•	•	
Develops growing understanding of how their actions affects others and begins to accept the consequences of their actions.						•							
Demonstrates increasing capacity to follow rules and routines and use materials purposefully, safely, and respectfully.	•	•	•	•	•	•	•	•	•	•	•	•	
Increases abilities to sustain interactions with peers by helping, sharing, and discussion.	•	•	•	•	•	•	•	•	•	•	•	•	
Shows increasing abilities to use compromise and discussion in working, playing, and resolving conflicts with peers.	•	•	•	•	•	•	•	•	•	•	•	•	
Develops increasing abilities to give and take in interactions; to take turns, and to interact without being overly submissive or directive.	•	•	•	•	•	•	•	•	•	•	•	•	
Demonstrates increasing comfort in talking with and accepting guidance and directions from a range of familiar adults.													
Shows progress in developing friendships with peers.													

Head Start Domains and Indicators Associated with Core and Center Experiences

Domain & Indicators	Experience												
SOCIAL & EMOTIONAL CONTINUED	1	2	3	4	5	6	7	8	9	10	11	12	T-H
Progresses in responding sympathetically to peers who are in need, upset, hurt, or angry; and in expressing empathy or caring for others.													
Develops ability to identify personal characteristics including gender, and family composition.													
Progress in understanding similarities and respecting differences among people, such as genders, race, special needs, culture, language, and family structures.													
Develops growing awareness of jobs and what is required to perform them.													
Begins to express and understand concepts and language of geography in the contexts of their classroom, home, and community.													
APPROACHES TO LEARNING													
Chooses to participate in an increasing variety of tasks and activities.	•	•	•	•	•	•	•	•	•	•	•	•	
Develops increased ability to make independent choices.	•	•	•	•	•	•	•	•	•	•	•	•	
Approaches tasks and activities with increased flexibility, imagination, and inventiveness.	•	•	•	•	•	•	•	•	•	•	•	•	
Grows in eagerness to learn about and discuss a growing range of topics, ideas and tasks.	•	•	•	•	•	•	•	•	•	•	•	•	•
Grows in abilities to persist in and complete a variety of tasks, activities, projects, and experiences.	•	•	•	•	•	•	•	•	•	•	•	•	•
Demonstrates increasing ability to set goals and develop and follow through on plans.	•	•	•	•	•	•	•	•	•	•	•	•	•
Shows growing capacity to maintain concentration, despite distractions and interruptions.	•	•	•	•	•	•	•	•	•	•	•	•	•
Develops increasing ability to find more than one solution to a question, task or problem.				•					•	•			
Grows in recognizing and solving problems through active exploration, including trial and error, and interactions and discussions with peers and adults.	•	•	•	•	•	•	•	•	•	•	•	•	•

Head Start Domains and Indicators Associated with Core and Center Experiences

Domain & Indicators	Experience												
APPROACHES TO LEARNING CONTINUED	1	2	3	4	5	6	7	8	9	10	11	12	T-H
Develops increasing abilities to classify, compare, and contrast objects, events, and experiences.	•	•	•	•	•	•	•	•	•	•	•	•	•
PHYSICAL HEALTH AND DEVELOPMENT													
Develops growing strength, dexterity, and control needed to use tools such as scissors, paper punch, stapler, and hammer.	•	•	•		•	•	•						
Grows in hand-eye coordination in building with blocks, putting together puzzles, reproducing shapes and patterns, stringing beads and using scissors.													
Progresses in abilities to use writing, drawing and art tools including pencils, markers, chalk, paint brushes, and various types of technology.													
Shows increasing levels of proficiency, control and balance in walking, climbing, running, jumping, hopping, skipping, marching and galloping.													
Demonstrates increasing abilities to coordinate movements in throwing, catching, kicking, bouncing balls, and using the slide and swing.													
Progresses in physical growth, strength, stamina, and flexibility.													
Participates actively in games, outdoor play and other forms of exercise that enhance physical fitness.													
Shows growing independence in hygiene, nutrition and personal care when eating, dressing, washing hands, brushing teeth and tolieting.													
Builds awareness and ability to follow basic health and safety rules such as fire safety, traffic and pedestrian safety, and responding appropriately to potentially harmful objects, substances and activities.	•	•	•	•	•	•	•	•	•	•	•	•	