

***Backyard Bugs* Teacher's Guide**

For

Level 1 (Grades K–2)

And

Level 2 (Grades 3–5)

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Overview

Backyard Bugs allows students in grades K-5 to learn about life science topics through exploration of 19 different “backyard bugs.” The software emphasizes student inquiry and discovery as a way to achieve knowledge and understanding.

In **Backyard Bugs**, the word “bug” is not used as a strict scientific term, but as it is used in daily language. Information on other arthropods such as spiders, millipedes, and centipedes is also included.

All of the **Backyard Bugs** are members of the Phylum Arthropoda. However, only those bugs that are members of the Class Insecta should be referred to as “insects.” The other bugs are members of different classes. For example, arachnids, commonly known as spiders and tarantulas, are from the class Arachnida. Centipedes are members of the Class Chilopoda, and millipedes are from the Class Diplopoda. In addition, the Order Hemiptera includes members commonly referred to as “true bugs.”

Backyard Bugs is divided into two levels: Level 1 for grades K-2, and Level 2 for grades 3-5. Each level has a variety of bugs to explore and habitats to investigate. The bugs included in both levels of the software reflect the diversity of the arthropods, with a wide variety of habitats, body types, and lifestyles. In the software, there are pictures, videos (most running about one minute), and activities for each bug to encourage learning and exploration.

Using *Backyard Bugs*

See the *Backyard Bugs Level 1 Users Guide* and the *Backyard Bugs Level 2 Users Guide* for more information about navigation and using the software.

Backyard Bugs Level 1 has five habitat screens and eight bugs available, as shown in the following table.

The *Backyard Bugs* for Level 1 (Grades K–2)

Common Name	Found in the <i>Backyard Bugs</i> Habitat Screen	Arthropod Order	Type of Metamorphosis (Insects Only)	Scientific Genus and Species Names (Where Known)
Antlion	Soil	Neuroptera	Complete	<i>Myrmeleo sp.</i>
Cockroach	Garage	Orthoptera	Incomplete	<i>Periplaneta americana</i>
Dragonfly	Pond	Odonata	Incomplete	Several species
Hickory Horned Devil – Regal Moth	Tree	Lepidoptera	Complete	<i>Citheronia regalis</i>
Luna Moth	Tree	Lepidoptera	Complete	<i>Actias luna</i>
Monarch Butterfly and Caterpillar	Milkweed	Lepidoptera	Complete	<i>Danaus plexippus</i>
Spider	Garage	Araneae	Not applicable	Several species
Whirligig Beetle	Pond	Coleoptera	Complete	Several species

Backyard Bugs Level 2 has seven habitat screens and nineteen bugs available, as shown in the following table.

The Backyard Bugs for Level 2 (Grades 3–5)

Common Name	Backyard Bugs Habitat Screen	Arthropod Order	Type of Metamorphosis (Insects Only)	Scientific Genus and Species Names (Where Known)
Antlion	Soil	Neuroptera	Complete	<i>Myrmeleo sp.</i>
Blepharicerid	Waterfall	Diptera	Complete	<i>Blepharicera spp.</i>
Caddisfly Larva	Waterfall	Trichoptera	Complete	Several species
Centipede	Soil	Chilopoda	Not applicable	Several species
Cockroach	Garage	Orthoptera	Incomplete	<i>Periplaneta americana</i>
Dragonfly	Pond	Odonata	Incomplete	Several species
Giant Water Bug	Pond	Hemiptera	Incomplete	<i>Lethocerus americanus</i>
Hickory Horned Devil – Regal Moth	Tree	Lepidoptera	Complete	<i>Citheronia regalis</i>
Honeybee	Garden	Hymenoptera	Complete	<i>Apis mellifera</i>
Luna Moth	Tree	Lepidoptera	Complete	<i>Actias luna</i>
Mantis	Garden	Orthoptera	Incomplete	<i>Tenodera aridifolia</i>
Millipede	Soil	Diplopoda	Not applicable	Several species
Monarch Butterfly and Caterpillar	Milkweed	Lepidoptera	Complete	<i>Danaus plexippus</i>
Mosquito Larva	Pond	Diptera	Complete	<i>Culex pipiens</i>
Spider	Garage	Araneae	Not applicable	Several species
Stick Insect	Tree	Phasmida	Incomplete	<i>Diaperomera femorata</i>
Tachinid Fly	Milkweed	Diptera	Complete	<i>Lespesia archippivora</i>
Viceroy Butterfly	Milkweed	Lepidoptera	Complete	<i>Limenitis archippus</i>
Whirligig Beetle	Pond	Coleoptera	Complete	Several species

Backyard Bugs Teacher CD

The **Teacher CD** for **Backyard Bugs** includes other instructional materials that will support your use of the software in the classroom.

Video: Best Practices in Science Teaching

Included in the Teacher CD is a video demonstrating best practices in science teaching. The video presents primary and intermediate grades life science lessons, featuring teachers with expertise in science education, demonstrating ways to integrate **Backyard Bugs** as part of a standards-based approach to teaching science.

Level 1 and Level 2 User's Guides

The Teacher CD includes two guides, one for each level, with navigation through the habitats and bugs included in the software.

Sample Lesson Plans

Sample lesson plans offer suggested ideas for using **Backyard Bugs** with students. The sample lesson plans include science journal pages that teachers and students can use as a guide through the virtual backyard. Allowing students time to freely explore the software while using the sample lesson plans develops the students' inquiry skills.

Teachers may choose lessons or insects to emphasize the broad variety of bugs, or focus on a specific insect, habitat, or lifestyle. Teachers are encouraged to adapt the **Backyard Bugs** lesson plans to fit their specific needs.

Each sample lesson plan includes:

Scientific Background – This description gives a brief overview of the scientific background necessary to teach the lesson.

Vocabulary – This is a list of vocabulary words used in the specific lesson. A Glossary within the software contains definitions for **Backyard Bugs** vocabulary words.

Thinking Questions – Each lesson includes one or more example questions that can be used to spark critical thinking and to encourage students to go beyond factual responses with their descriptions and explanations.

Exploratory and Extension Activities – These activities are intended to capture interest and to engage students in science. They are one way to set the stage for using **Backyard Bugs** software. Other cross-curricular activities can be found in the *Across the Curriculum Using Backyard Bugs* section of this Teacher Guide.

Science Journal Page – These pages allow students to record their observations and they are engaged in the use of the software.

Science Journal Page Answer Key – These pages provide suggested responses to student observations.

Assessment

The resources found on the **Teacher CD** offer different strategies for assessing student work in ***Backyard Bugs***.

Level 1 and Level 2 Science Journal pages - Use the appropriate Science Journal Page answer key and rubrics to evaluate the observations students make while using ***Backyard Bugs***.

Level 2 Quizzes - A quiz for each bug is available in the software, in an interactive format. The quizzes can be used as a pretest or posttest to measure students' understanding of the content. A printed version of the same content, available on the **Teacher CD**, can be used in a written format.

List of Bugs Featured in *Backyard Bugs*

Milkweed Screen	Pond Screen	Waterfall Screen	Tree Screen	Garden Screen	Soil Screen	Garage Screen
Grades K-2:		Not Available		Not Available		



Monarch Butterfly



Whirligig Beetle



Hickory Horned Devil



Antlion



Cockroach



Monarch Caterpillar



Dragonfly



Luna Moth



Spider

Grades 3-5:



Monarch Butterfly



Whirligig Beetle



Caddisfly Larva



Hickory Horned Devil



Honeybee



Antlion



Cockroach



Monarch Caterpillar



Dragonfly



Blepharicerid Larva



Luna Moth



Mantis



Millipede



Spider



Viceroy



Mosquito Larva



Stick Insect



Centipede



Tachinid Fly



Giant Water Bug

Science Standards in *Backyard Bugs*

The National Science Education Standards (NSES) provide the underpinning for the standards used in *Backyard Bugs*. These Standards focus on key concepts and foundational principles of science education. The content portion of the Standards is divided into grade level categories (K-4, 5-8, and 9-12), and includes eight major Standards.

To learn more about NSES, go to their web site at: <http://www.nsta.org/standards>

Many state and local school districts have their own science education standards. In most cases, these standards are based on the NSES.

Backyard Bugs focuses primarily on the life science content Standards, but also includes universal science ideas and key processes including inquiry methodology, investigation skills, and the historical aspects of nature and science. *Backyard Bugs* is designed for grades K-5. Because the NSES Standards are divided into K-4 and 5-8 levels, most of the Standards incorporated into *Backyard Bugs* come from the K-4 level. Some lesson plans are augmented using the 5-8 Standards as a guide.

Unifying Concepts and Processes: This Standard is presented for grades K-12, because these concepts need to be developed over time. They form foundation for a student's learning experience in science, and function as a framework for students to learn about science and scientific processes. In the elementary grades, instruction should focus on the meaning and use of these Standards. Unifying concepts and processes include:

- Systems, order, and organization – introduces the concepts that related objects or organisms can form an organized group and that all aspects of the universe are understandable, and exhibit predictable behavior. For example, communities of bees function as structured systems within their colonies.
- Evidence, models, and explanation – includes the concept that through observation, data collection and the development of logical ideas, one can propose an explanation of how nature functions. For example, models of a bees' hive help explain the role and behavior of the bees.
- Change, constancy and measurement – focuses on the idea that some aspects of the universe stay the same while others change. Measurement is a means to quantify some aspects of the natural world. For example, a Celsius thermometer can measure the changeable temperature of the air.
- Evolution and equilibrium – introduces the idea that the current form and function of natural objects is due to gradual and occasional changes that have occurred over time. Frequently, these changes offset earlier changes to maintain a balance known as equilibrium. Populations of organisms can evolve and reach a new equilibrium when faced with environmental changes. For example, using a pesticide to control a pest kills those members of a population that are most susceptible and leaves the

members who are naturally resistant. The resistant population will increase and reach a new equilibrium.

- Form and function – conveys the relationship between the shape or appearance of an object or system and its use. For example, the shape and coloring of stick insects allows them to blend in with their surroundings to hide from predators.

Content Standard A: Science as Inquiry: This content Standard focuses on developing the abilities and understanding necessary for scientific inquiry. Children in the elementary grades can conduct basic experiments with concrete results. They are able to use simple instruments of measurement and observation (rulers, scales, and magnifying glasses). They can plan an investigation and communicate their results. Students will be able to:

- Ask a question about their environment – students develop questions that may be answered with scientific knowledge and observations. For example, students may consider the question, “How do antlions get food?”
- Plan and conduct a simple investigation – students can develop investigations to answer specific questions. For example, students may develop an experiment in which they observe antlions in their pits to help answer the question, “How do antlions capture prey?”
- Gather data – students use measuring instruments such as rulers, thermometers, balances, microscopes, and magnifiers to help them investigate a problem. For example, a student may use a magnifying glass to examine parts of an insect.
- Use this data to construct an explanation – students must evaluate their data and information to develop an explanation. For example, students may gather data that shows that animals tend to resemble their parents.
- Communicate their investigation and explanations – students should be able to critique and analyze their work and then present it, either in written, verbal, or pictorial form. For example, students studying the life cycle of a butterfly could draw the relationship between the stages of development.

Content Standard C: Life Science: The Life Science content Standard builds understanding of living things, their life cycles, and their habitats. Students will study:

- Characteristics of organisms – each organism has different structures that serve different functions. For example, insects have many different types of sense organs, wings, mouthparts, and legs. These characteristic body parts help the insects interact and survive in their specific environment.
- Life cycles of organisms – different organisms have different life cycles. These life cycles include being born, becoming adults, reproducing, and eventually dying. Plants and animals typically resemble their parents. Some characteristics, such as number of legs, are inherited from an organism's parents. Other characteristics, like having the ability to roller-skate, are learned behaviors that cannot be passed on to the next generation.
- Organisms and their environments – an organism's behavior is determined by their environment. Factors such as the amount of food and resources, the numbers of other organisms, and physical characteristics like the weather and pollution clearly affect an organism's behavior. In addition, all organisms cause change in their environment. For example, humans construct buildings in ways that alter the physical landscape of a location.

Content Standard G: History and Nature of Science: The content strand emphasizes the contributions of significant scientists from the past. Through scientific inquiry, these men and women provided the foundation on which new science and technology ideas are being built. Science is on-going, and it is clear that there is still much to be understood and explained.

Scientific Methods

Students are encouraged to use scientific methods throughout *Backyard Bugs*. Introducing this process of thinking offers students a concrete way to explore the world around them. Scientific methods do not encompass a rigid process. There can be any number of steps in the real world, and the steps frequently overlap and repeat.

The basic steps for using scientific methods are:

- **Make observations about the world.** This first step involves observing an event or characteristic of an object or organism. For example, students might observe that millipedes are found in dark places. Observation frequently leads to a question about the event or characteristic.
- **Ask questions based on the observations.** The observation process usually triggers questions regarding how or why an event or characteristic occurs. Students should state what they want to learn or find out. For example, “Why are millipedes found in dark places?”
- **Develop a hypothesis.** A hypothesis is a possible answer to a question. It can be tested by gathering data through observation or measurement. “Millipedes are afraid of bright light” is not a testable hypothesis. It can be modified to form a testable hypothesis. One example might be, “Millipedes will choose a dark place over a light one.” Expect students to need some help revising their questions to develop a testable hypothesis.
- **Conduct an experiment to test the hypothesis.** An experiment has steps designed to test the hypothesis. For example, give the millipede a choice between a light place and a dark place. Students make observations, collect data, and record what happened during the experiment.
- **Draw conclusions based on the results.** A conclusion describes whether the observations and data support or refute the hypothesis. If the data do not support the hypothesis, determine why, and proceed to the next most likely hypothesis. Even if data support the hypothesis, it could still be an incorrect explanation. A hypothesis can be disproved, but not proven.
- **Share the findings with others.** Organize observations and data from the experiment into a usable form, such as a table or graph. Explain the results of the experiment. The experiment often raises new questions that will lead to another hypothesis. This is typically explained in the results section of the experiment.

Across the Curriculum Using *Backyard Bugs*

Use these exploratory and extension activities to set the stage for investigation of as well as to create a connection between the *Backyard Bugs* and other content areas. These activities are intended to capture interest and to engage students in a science context. Many of the ideas presented are suggested for a specific arthropod, but most can be adapted to fit the specific needs of each teacher and class. While there are many enrichment lessons that can provide information about the bugs investigated in *Backyard Bugs*, this set of materials will help you get started.

Having bugs in the classroom is one way to investigate bugs more closely. Stores and online retailers such as Carolina Biological Supply Company will have bugs and supplies that you need to care for live animals in your classroom. Visit <http://www.carolina.com> for more information.

Fine Arts

Monarch Butterflies

Using black construction paper cut out the shape of the monarch. Prepare one butterfly for each student. Have a black pipe cleaner available for each student to use as a proboscis. Provide scraps of orange and white paper and glue sticks for students to create a collage of the wing pattern.

Make Puppets, Models, Bean Bags, or Papier Maché Bugs

Use puppets to stage a play about a bug. Follow up with a discussion about visual arts critiquing.

Literature Connections

Make life cycle booklets about one of the *Backyard Bugs* with index cards. Create bug bookmarks to use with the booklets.

Bug Postage Stamp

Visit <http://www.govspot.com/ask/suggestastamp.htm>, to learn about the process used by the U.S. Postal Service to get ideas from the public about new stamp designs. Have students create a postage stamp to honor one of the bugs they are studying.

Bilateral Symmetry Art

Use finger paints or water colors to draw one half of a bug, such as a butterfly, fold the paper in half to create the other half of the bug.

Use the different bugs from *Backyard Bugs* to investigate bilateral symmetry, the concept that animals have a body plan that has the left half and right half of the body forming a mirror image when the animal is divided down the length of its body. Explore the patterns for each Backyard Bug.

The Art of Ink Painting

Discuss the oriental art of ink painting in countries such as China and Japan. Visit http://insects.org/ced1/or_art.html for more information about ink painting. Include the use of insects as art subjects in the discussion.

Dragonfly Knot

Using common twine or cord and Chinese ornamental knotting procedures, students will create a dragonfly knot. Visit <http://www.dfw.net/~jazzman/knotter/dragon.htm> for more information.

The Very Busy Spider

Display the book *The Very Busy Spider* by Eric Carle (Scholastic Paperbacks, 1990, ISBN: 0590431196)

Demonstrate how the author, Eric Carle, creates his illustrations by tearing tissue paper into shapes and layering them on paper to create his images. Each student will create a picture of a spider using torn strips of tissue paper and glue.

Insect Habitat

Using large lengths of butcher paper have students plan and create a mural of insects and their habitat.

Language Arts

Bug Words

Have students brainstorm a list of 5-10 descriptive words they learned studying one of the bugs such as proboscis, migrate, wings, abdomen, and thorax.

Create a graphic with several columns. Label each of the columns with one of the lifecycle phases of the bug: egg, caterpillar, chrysalis, and butterfly. Have students match the descriptive word to the column in which it belongs.

Have students write a poem about the bug using the descriptive words.

Have students determine the number of sound parts in each word by counting out loud and clapping their hands. Create a chart on the white board with labels: one syllable, two syllables, three syllables, four syllables.

Have small groups work together to create definitions of the words. With the teacher guiding the process, the class will decide on their class definition of each word. Use the ***Backyard Bugs*** glossary.

Bug Research

Each student will use the library computer catalog or card catalog to locate two sources on the bug: one print and one non-print such as a photograph or graph.

Each student will write bibliographical information of each item for use in a bibliography.

Each student will read the print media and write down two to four pieces of information (depending on the grade level and/or ability) that they find interesting

about the bug. Students should summarize the information after having a discussion about the difference between summarizing and plagiarizing. Students will learn the terms topic sentence (or unifying idea) and supporting detail sentences in relationship to their research. Students will circle topic sentence and underline supporting details.

Bug Play

Using a life cycle outline written on the whiteboard, have students create storybook frames for a play about a bug they studied. Students in small groups will create narratives to accompany outline sections. Use bug puppets to stage the play.

Reading and Responding to the Very Hungry Caterpillar

Read *The Very Hungry Caterpillar* by Eric Carle (Scholastic Paperbacks, 1990, ISBN: 0590431196). Discuss similarities and differences between this caterpillar and the hickory horn devil or the monarch larva.

Bug Poetry

Read aloud *insectlopedia* by Douglas Florian (Harcourt Children's Books, 1998, ISBN: 0152013067). Discuss each poem along with its illustration. Create an idea web for each creature. Record the student's observations on a large piece of paper during the reading and discussion. Read each poem again after the discussion.

Nocturnal Bugs

Read aloud *Night Fliers: Moths in Your Backyard (Backyard Bugs)* by Nancy Loewen and Brandon Reibeling (Picture Window Books, 2003, ISBN: 1404801448). Discuss other creatures that are active at night. Make a list of the nocturnal bugs featured in ***Backyard Bugs***: millipedes, centipedes, cockroaches, some spiders etc.

Arthropod Word Scramble

Provide students with a scrambled list of words related to arthropods. Ask students to alphabetize the words. As a group, discuss the definition of each word.

Then have students read the giant water bugs article at <http://www.naturenorth.com/summer/bug/toebite.html>. Have students find examples from their alphabetized arthropod list and underline each found word.

Dragonfly Poetry

Read Alfred Lord Tennyson's 1833 poem, *The Dragon-fly*. Discuss descriptive language, the imagery, thoughts and words used in Tennyson's poem. How many lines did he use? Does he create a clear picture of a dragonfly? Discuss the rhyme pattern used in the poem: A, A, B, B, B, C, C, C. Introduce the concept of metrical foot. Have the class write as a group, or individually a poem using another insect.

Oral Presentations on One of the Bugs

Objective: Students are to present an oral presentation before the class. They can choose any topic related to one of the **Backyard Bugs**.

Bug Discussion and Research

Teacher should ask students to list what they already know about a bug after using **Backyard Bugs**. Ask students to list what else they would like to know about the bug. At the library, students will use encyclopedias and other reference books to further research the bug. Resources should be documented and information checked for accuracy. After reading, students will add to their lists of things they know about the bug and share the new information with the class.

Centipedes and the Dictionary

This is an exercise for dictionary practice. Have students vertically print the letters CENTIPEDE. The letter C should be larger than the other letters. C will be used for the centipede head. Students will look up words for each of the other letters (ENTIPEDE). Each word will be printed horizontally, so that the target letter is in the middle. When the exercise is completed, students will have the picture of a centipede with legs—the horizontal words will be the legs.

Greek and Latin Root Meanings

For example use *cent* and *pede* to introduce or reinforce Latin and Greek root learning. Have students think of words that use *cent* and *pede*. In small groups, have students look through the dictionary or use www.dictionary.com to find as many words that include *cent* and *pede*. Other affixes can be introduced, such as *pod*, *pes*, and *mil*. When the research is complete, have students share their results. Write all the words on the whiteboard for a class list.

Fables

Introduce fables as a literature genre. Discuss the fable's definition, purpose, style, and some famous fable authors, such as Aesop and Thurber.

Visit <http://www.aesopfables.com/> for a selection of *Aesop's Fables*.

James Thurber's fables for the young audience can be found in *Fables for Our Time and Famous Poems* (Perennial, 1990, ISBN: 0060909994).

Have students create a fable (orally) about a stick insect and a bird, for example.

Mathematics

Descriptive Words

Have students describe the patterns of color, texture, shape and size of the bugs they studied, such as: leathery, transparent, oval, elongated, round, rectangular, triangular, square, funnel, long, narrow, or slender.

Bug Multiplication

Discuss one of the insect that has three body parts, such as the bee. Ask how many parts does one insect have? (3) How many body parts would you have if you had two insects? Proceed with this for the multiplication tables for three. This can be done for multiplication tables for six, with insects that have six legs.

Caterpillar Math

For 2nd grade: Create worksheets with rows and columns of caterpillars (3 boxes with 16 caterpillars, and 2 with 12 caterpillars). For the 16 caterpillar worksheet, place four caterpillars in each of four rows. For the 12 caterpillar worksheets, create two rows with six caterpillars in each row. Have students circle caterpillar groups to represent $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{3}$, $\frac{1}{6}$.

Bug Symmetry

Use finger paints or watercolors to draw one half of a bug, such as a butterfly, fold the paper in half to create the other half of the bug.

Use the different bugs from ***Backyard Bugs*** to investigate bilateral symmetry, the concept that animals have a body plan that has the left half and right half of the body forming a mirror image when the animal is divided down the length of its body. Explore the patterns for each ***Backyard Bug*** and write descriptions of each bug's symmetry.

Bug Sorting

Use the different bugs from ***Backyard Bugs*** to investigate sorting and grouping. Create cards with words or pictures representing each of the ***Backyard Bugs***. Discuss various ways to sort the bugs, for example "What do they eat?" (plants, animals, or decaying material) or "Where do they live?" (pond, stream, soil, trees, or flowers).

Multicultural Education

Antlions Around the World

Visit www.antlionpit.com/culture.html for reference information.

Include the riddle by Aldhelm at www.antlionpit.com/aldhelm.html, in Latin and English, when discussing the different names for antlions from different languages. Use a world map to have students identify the countries where the languages for the different antlion names are spoken.

Caterpillars in Japanese Culture

Read *The Girl who Loved Caterpillars: A Twelfth-Century Tale from Japan* by Jean Merrill. Discuss the story, focusing on details about Japan and Japanese culture.

Origami

Investigate the ancient Japanese art of origami. Paper folding steps for bugs can be found in *Origami Insects and Their Kin* (Dover Publications, 1995, ISBN: 0486286029). Start by creating an origami butterfly. Follow the paper folding steps at www.paperfolding.com/diagrams/.

Eating Bugs

Visit http://stalkingthewild.com?why_not_bugs.html then click Articles. Read *Why Not Bugs?* Lead students in a discussion about eating bugs and insects. Ask them to discuss the differences between cultures and how groups of people feel about eating bugs.

Keeping Kosher and Eating Bugs

Read *The Handy Bug Answer Book* by Gilbert Waldbauer (Visible Ink Press, 1998, ISBN: 1578590493). In addition to information about bugs, read and discuss the section about why some bugs may be considered Kosher and can be eaten by people who keep Kosher. Discuss what Kosher eating habits are and how people in different parts of the world observe this lifestyle.

Dragonflies in Folklore

Visit <http://people.colgate.edu/wda/folklore.htm> as a starting point to investigate dragonflies in folklore and art.

Centipede Words

Search for translations of centipede. Visit <http://open-dictionary.com/Centipede> then discuss different languages and the words chosen for specific insects. Include Native American language Web sites.

Centipede Fairy Tale

Visit <http://www.blackmask.com/books54c/jpnft.htm> and have students read the Japanese fairy tale *My Lord Bag of Rice*, about a dragon and centipede. Find the word for centipede in Japanese.

Stick Insect Cartoon

Visit http://www.cartoonstock.com/directory/s/stick_insects.asp to introduce students to one style of cartooning. Then have each student create one bilingual stick insect cartoon. Students will choose a language and a nation they will use for the setting of their cartoon. They will create a simple stick drawing with a phrase or one sentence. For example, the English language frame, the stick insect says, "I am the largest insect in the world." In the Spanish language frame, the stick insects say, "Yo soy el insecto mas largo del mundo."

Bee Information

Visit <http://www.burlesons-honey.com/facts-and-figures/honey-lore-winners.htm> to learn about bees and honey in an historical perspective. Visit

<http://members.aol.com/beetools/odd.htm> to find out about bees in Great Britain. Visit <http://gears.tucson.ars.ag.gov/ic/trivia.html> to read facts about bees.

Bees Around the World

Discuss honey and bees' worldwide cultural and economic importance, historical and present.

Music

Cockroach Conga

Obtain the CD *Spinning Tails* by Steve Pullara and His Cool Beans Band ([Released](#) 2001, ASIN B00005Q6ZT). Teach the song *Cockroach Conga*. Students can also put this song into a Conga dance.

Original Antlion Songs

Have students create antlion lyrics to the tunes of familiar songs.

These are some examples.

The Antlion Digging Song

(sung to *Row, Row, Row your Boat*)

Dig, Dig, Dig a pit

Backward, down you go

Make a slope

Then sit and hope

Food will come your way

The Antlion Hunting Song

(sung to *Johnny comes Marching Home*)

Prey slides down the sandy slope

Hooray, Hooray

There's no chance to get away

Hooray, Hooray

Flies and Ants and Spiders, too

None can climb the slanted wall

I'll just sit and wait to eat them all

Doodlebug Music

Visit <http://www.nativeground.com/nature.asp> for clips of songs related to bugs.

Listen to clips from *Crawdads, Doodlebugs & Creasy Greens* by Doug Elliott.

Help students identify the different instruments as they are playing in the songs.

Antlion Dance

Have students form a large circle. Each student will have both hands on the next student's shoulders. Explain that the antlion makes a trap by walking backward in a circular motion, making smaller and smaller circles. Have them practice walking backward slowly. Use music such as *The Circle of Life* by Elton John, *Draw Me A Circle* by Barbara Streisand, *Here We Go Round The Mulberry Bush*, or other circle-themed music, have students walk backward, making smaller and smaller circles until they are clustered in a tight clump.

Insect Song

Teach a song about insect body parts using the tune of *Head and Shoulders, Knees and Toes*:

Head and thorax, abdomen, abdomen

Head and thorax, abdomen, abdomen

Six legs, two wings and an exoskeleton

Head and thorax, abdomen, abdomen

Head and thorax, abdomen, abdomen

Head and thorax, abdomen, abdomen

Big eyes, small size and little feelers, too

Head and thorax, abdomen, abdomen

Cockroach Song

Teach this song and once the children are familiar with the accompaniment they can create a new song with new words about the cockroach. Use factual information about the cockroach.

La Cucaracha

Coro:

La cucaracha, la cucaracha,
ya no puede caminar,
porque no tiene, porque le falta,
la patita principal.

Dicen todas estas niñas,
que yo soy la más chiquita,
si señor eso es muy cierto,
y también la más bonita.

Coro.

Rhythm Experiences

Show students how to use rhythm sticks, pick out the number of syllables of arthropod related words, and focus on accents.

Nature Sounds

Discuss musicians that chose to focus on nature sounds. This lesson chooses an aquatic habitat.

Water music by Händel is on tracks from a variety of CDs. Some selections include:

- *Water Planet* (SAS, 2003, ASIN: B00008NV7G)
- *Yellowstone: The Music of Nature* (American Gramophone, 1989, ASIN: B0000005N7)

Have students practice listening skills by listening to the sounds of water on a music track. Ask for reactions to the listening experience.

Music that has an insect theme, such as *Flight of the Bumble Bee* by Nikolay Rimsky-Korsakov, can be used to expose students to classical music as they investigate insects in ***Backyard Bugs***.

Millipede Music

Make groups of musicians with two students on hand drums, two students on small xylophones who will control the movement of the student millipede.

Students who make up the millipede will pair off. Each pair will tie their legs together as if preparing for a three-legged race. Pairs will line up to represent a millipede body. One student will lead the body as the head. When the drummers sound the first beat, the first two pairs will use their outside, free legs to move forward—millipedes have two pairs of legs per segment, the two pairs of legs move in synchrony. On the second beat, the next two pairs will move forward and so on until all students have moved. Drummers should beat with a steady, slow beat, like a *lento*. When students understand the rhythm of millipede leg pairs with their own individual set of muscles, moving in pairs, each slightly out of phase with the pair in front and the pair in back, then the xylophones can do a glissando up and down the keyboard. When student millipede body/legs hear the glissando, they are to increase their movement rhythm, so the body produces a wave effect.

The Tarantella Dance

Visit this site to learn about the tarantella dance:

<http://www.streetswing.com/histmain/z3tartla.htm>

Use this website to discuss the history and legends surrounding the tarantella. Select tarantella music and play them for the students.

Echo Cadence Songs

Students will learn an echo cadence and create their own stanza. Divide class into two groups. One group will sound out the first cadence. The second will echo each line when it is finished. For the second stanza, the second group will sound off with the first group as the echo.

Group 1 Leads the Cadence

I am here to let you know. (Group 2 echo)
Centipede will nip your toe. (Group 2 echo)
Cousin to the millipede, (Group 2 echo)
It's a nasty cuss indeed. (Group 2 echo)

Group 2 Leads the Cadence

Centipede is fun to see. (Group 1 echo)
But it's not a pet for me. (Group 1 echo)
Wormlike, elongated too, (Group 1 echo)
Poison claws awaiting you. (Group 1 echo)

Students can create other stanzas to continue the song.

Stick Insect Walk

This is a cakewalk type of activity. The music activity will focus on the stick insects six legs, its ability to regenerate a leg and its ability to use camouflage to be safe.

Place tape colored squares on the floor (green, yellow, brown). On one square of each color, write the word regenerate a leg. Students will be either green, yellow, or brown stick insects. Each student will be given six strips of their color. The strips represent six legs. When the music starts, students will walk in a circle with the colored squares to their left. When the music stops, if the color square to the immediate left matches the students' camouflage, they are safe. If it is a different color, they have to forfeit a leg. The leg will be placed in a lost leg pile. If students are opposite their own color square and that square has regenerate a leg on it, the student can fetch a previously lost leg. The cakewalk music will continue in this manner. When students lose all six legs, they are out of the game.

Bee Dance as Communication

Divide students into small groups. Have them create dances to tell each other about sources of food. When they are ready, they will explain the various patterns to the class, then present two or three dance skits to demonstrate the use of their dance language. They will ask the class where the food source is after each presentation.

Bug Songs

Visit http://www.acme.com/jef/science_songs/ to listen to science songs. Scroll down to find songs about bugs.

Reading/Literature

Cockroach Cooties (Laurence Yep, Hyperion Paperbacks for Children, 2000. ISBN: 0786813385).

Termie the Termite by Angela Hurrell (found at <http://pages.zoom.co.uk/talespinners/termie.htm>).

Crickwing (Janell Cannon, Harcourt Children's Books, 2000. ISBN: 0152017907).

Breakout at the Bug Lab (Ruth Horowitz, pictures by Joan Holub, Puffin Books, 2002. ISBN: 0142302007).

The Boy Who Made Dragonfly: A Zuni Myth (Tony Hillerman, illustrations, by Janet Grado, Sagebrush Bound, 1999. ISBN: 0613133080).

A Dragon in the Sky: The Story of a Green Darner Dragonfly (Laurence P. Pringle, illustrations by Bob Marstall, Scholastic Books, 2001. ASIN: 0531333159).

Dragonfly (Alice McLerran, Absey & Company, 2000. ISBN: 1888842229).

Selections from *Earthkeepers: Observers and Protectors of Nature* (Oxford Profiles) (Ann T. Keene, Oxford University Press, 1994. ISBN: 0195078675).

Charlotte's Web (E.B. White, Illustrations by Garth Williams, HarperTrophy Books, 1974, ISBN: 0064400557).

James and the Giant Peach (Roald Dahl, illustrated by Lane Smith, Penguin USA, 2000. ISBN: 0140374248)

Social Studies/Geography

Monarch Butterfly Migration

Using a United States or world map and colored pins or dots, plot the migration path of a population of monarchs. Use data found at Journey North ("Engaging Students in a Global Study of Wildlife Migration") (www.learner.org/jnorth) or other resources.

Using a world map and colored pins or dots, identify the countries around the world where monarchs have been sighted. Have students name the country, its capital, and the continent it is found on.

Field Trip to a Local Pond

In preparation for a field trip to a local pond, students will use grid coordinates to locate ponds and water systems on an area map. Students should plan to contact the area national park range, watershed organization or other community agency to determine which pond would be a good choice for a visit and why. When the field trip pond is chosen, students will construct a map detailing possible routes for transportation to the pond. Students will discuss and write down what they will attempt to observe while at the pond. At the pond, with teacher assistance, students will record observation in their journals. The post field trip activity will be to create a poster of pond activity and environment.

Another post field trip activity is for students to create shoebox dioramas of a bug's pond habitat.

State Symbols

Students will understand how knowing a state's symbols, such as its motto, seal, flower, nickname, flag, bird, tree, song, fish, gem, dance, ship, folk song, fruit, grass, tartan, insect, and fossil, is a great way to get a basic understanding of that state—its geography, sociology, natural resources, flora, fauna.

Visit <http://www.enchantedlearning.com/usa/states/> to investigate the insect selected as the state symbol for each of the states. Have students use a political map to create a mosaic of the state insect symbols for their region of the United States.

Humans and Millipedes

Discuss the term ecosystem and factors important to human survival and why. Have students list factors in an ecosystem that people can live in, such as environment, climate, and natural resources. Discuss the millipede's ecosystem. Have students describe the type of ecosystem a millipede must be in, in order to survive, as well as describe its basic needs, such as food, shelter, and natural resources.

Ask students how the needs of each group can conflict or contribute to the other group. Create a chart titled Millipede/Human Society Impacts. One column will be labeled positive and the other column labeled negative.

Web-based Learning

Creating Frequently Asked Questions (FAQs)

Have students research and write a set of frequently asked questions (FAQs) about one of the ***Backyard Bugs***. Students can begin by writing their own questions then use Web resources, library resources, and Web sites to answer their questions.

Extend the activity by having students review Web resources, library resources, and web sites to expand their lists of questions and answers.

Backyard Bugs Class Web Site

Create a Web site about one of the ***Backyard Bugs*** for your class or school and have students post the FAQs. Direct students to review other students' postings and provide feedback about the information.

Writing

A Day in the Life of a Backyard Bug

Have students write about a day in the life of one of the ***Backyard Bugs***. Tell students to imagine that they are that insect and have the ability to keep a journal

about their lives and experiences. Students should write about what a day in their lives is like.

Writing About a Bug

Using the information students obtained from their ***Backyard Bugs*** research, have each student write a short paragraph that includes a topic sentence (unifying idea) and supporting details.

Write descriptions in the form of sentences of the life cycle of a bug. These should not be in sequence. Have students cut out the sentences, put them in sequence and paste them in correct sequence on another piece of paper.

Using Commas

Discuss how to use commas in a series of three similar things. Some caterpillars eat pears, apples, and leaves.

On a prepared worksheet, have students circle each comma in a series of six sentences related to a bug: for example, "The stages for the caterpillar's life cycle are an egg, a pupa, a caterpillar, and an adult."

Create two additional sentences that do not have series commas in place. Ask students to add the commas in the correct places.

Writing an ABC Book

Have students create their own ABC ***Backyard Bugs*** books. Draw and color illustrations to go along with a student-generated book called *My Backyard Bugs ABC Book*. For example, students could use the luna moth for L and hickory horned devil for H.

Prompted Writing

Have students respond to the following prompt: If you are walking at night, you might encounter some interesting creatures. Have students read their pieces to the class.

Compare and Contrast Essay

Have each student write a four paragraph comparison and contrast essay, comparing and contrasting elements in their daily environment with that of one of the environments necessary for one of the backyard bugs to thrive.

The first paragraph should have a clear topic sentence and two to three sentences explaining intent to compare (similarities) and contrast (differences) the student's daily environment needs and that of the whirligig. The second paragraph will address comparisons, while the third paragraph will address contrasts. The fourth paragraph sums up the essay's main point. An outline of the process will help students succeed at writing a simple four-paragraph comparison/contrast essay.

Backyard Bugs Fact Sheet

Using factual information from ***Backyard Bugs*** and other resources, students create a ***Backyard Bugs*** fact sheet. Students will learn how to take notes and use them to list ideas.

Each fact should be in a question/answer form. Questions should be created so that the answers are no more than three simple sentences.

Using Grammar to Write a Backyard Bugs Letter

List the following parts of speech on the whiteboard: noun, verb, complete sentence, compound sentence, noun/verb agreement, adjective, adverb, conjunction, pronoun, and preposition. Next to each listing, have students write examples that are relevant to one of the ***Backyard Bugs***, its habitat, behavior, physiology, and life cycle.

Using the information from their examples, students are to pretend that they are a scientist on an expedition. They are to write a letter to a friend, telling them about their expedition experiences with the bug they are investigating.

Writing Spider Haiku

Students will pretend that they are spiders and write a haiku poem about spiders.

Spider Facts

Make a class list of things students know about spiders.

References for *Backyard Bugs*

Use the following books to investigate information about the arthropods in *Backyard Bugs*. While there are many books and printed materials that can provide information about the bugs investigated in *Backyard Bugs*, this set of materials will help you get started.

Antlion

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- Hogue, Charles Leonard. 1973. *The Net-winged Midges: or, Blephariceridae of California*. Berkeley: University of California Press. ISBN: 0520094549.
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Berger, Melvin and Gilda, and Roper, Robert (Illustrator). 1997. *Flies Taste with Their Feet: Weird Facts About Insects*. Scholastic. ISBN: 0590939947.

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Cooper, Jason. 1996. *Centipedes*. Rourke Publishing. ISBN: 0866255745.

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Birch, Robin. 2004. *Cockroaches Up Close*. Heinemann Library. ISBN: 1410911462.

Brimner, Larry Dane. 2000. *Cockroaches*. Children's Press. ISBN: 0516267582.

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Kite, L. Patricia. 2001. *Cockroaches*. Lerner Publications. ISBN: 0822530465.

Stone, Lynn M. 1995. *Cockroaches*. Rourke Publishing. ISBN: 1559161612.

Yep, Laurence. 2000. *Cockroach Cooties*. Hyperion Books for Children. ISBN 0786813385.

Mound, Laurence, and Brooks, Steve. 2003. *1,001 Facts About Insects*. Dorling Kindersley Publishing. ISBN: 0789490412.

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McEvey, Shane F. 2001. *Dragonflies*. Chelsea House Publications. ISBN: 0791065979.

Gerholdt, James E. 1996. *Dragonflies*. Abdo & Daughters Publishing. ISBN: 1562394843.

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Choe, Jae C, and Crespi Bernard J. 1997. *The Evolution of Social Behavior in Insects and Arachnids*. Cambridge University Press. ISBN: 0521589770.

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Schwabacher, Martin. 2002. *Bees (Animalways)*. Benchmark Books. ISBN: 0761413928

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Web Links for *Backyard Bugs*

The following list of Web links provides a starting point for the investigation of arthropods in *Backyard Bugs*. Because the Web is dynamic and changing, some of these links may change or may become unavailable. In addition, new sites providing current, up-to-date research may become available. It is therefore important to regularly visit the Web for current research and new information regarding topics such as arthropods. Always be aware of the source of the information, and choose to reference or review only reputable sources.

Antlion

<http://www.ivyhall.district96.k12.il.us/4th/kkhp/1insects/antlion.html>

<http://www.antlionpit.com/>

http://www.antlionfarms.com/antlion_splash

<http://waynesword.palomar.edu/pljuly97.htm>

<http://www.wcsscience.com/antlion/page.html>

<http://www.ou.edu/research/electron/pictures/lion1/ant.shtml>

<http://www.conservation.state.mo.us/kids/out-in/2001/03/2.htm>

Blepharicerid Larva

<http://www.lucidcentral.com/keys/lwrrdc/public/Aquatics/ardipt/html/DIP2.htm>

<http://hbs.bishopmuseum.org/aocat/blepharoceridae.html>

<http://www.ent.iastate.edu/dept/research/systematics/bleph/biology.html>

Caddisfly

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<http://tolweb.org/tree?group=Trichoptera&contgroup=Endopterygota>

<http://www.earthlife.net/insects/trichopt.html>

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<http://www.szgdocent.org/ff/f-centi.htm>

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<http://www.student.loretto.org/zoology/Graphic%20webs/Centipede-%20external%20form.htm>

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<http://urbanentomology.tamu.edu/cockroaches.html>

<http://pested.unl.edu/roachind.htm>

<http://www.szgdocent.org/ff/f-arth2a.htm>

<http://yucky.kids.discovery.com/noflash/roaches/index.html>

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<http://www.npwrc.usgs.gov/resource/distr/insects/dfly/dflyusa.htm>

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<http://www.pca.state.mn.us/kids/c-october.html>

http://www.amonline.net.au/wild_kids/freshwater/water_bug.htm

<http://www.pma.edmonton.ab.ca/natural/insects/bugsfaq/waterbug.htm>

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Hickory Horned Devil - Regal Moth

<http://www.ces.ncsu.edu/depts/ent/notes/O&T/trees/note108/note108.html>

<http://www.forestryimages.org/browse/subimages.cfm?sub=841>

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<http://www.greensmiths.com/bees.htm>

<http://www.oardc.ohio-state.edu/agnic/bee/>

<http://www.42explore.com/bees.htm>

<http://cvs.anu.edu.au/andy/beye/beyehome.html>

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<http://www.pbs.org/wgbh/nova/bees/buzz.html>

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<http://www.earthsbirthday.org/butterflies/activitykit/lunamoths.html>

<http://www.ivyhall.district96.k12.il.us/4th/kkhp/1insects/luna.html>

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<http://www.ohiohistorycentral.org/ohc/nature/animals/insects/prmantis.shtml>
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<http://www.naturepark.com/ysmillip.htm>
<http://www.szgdocent.org/ff/f-milli.htm>
<http://www.thebigbugshow.demon.co.uk/millipede.html>
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<http://www.earthlife.net/insects/diplopoda.html>

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<http://www.monarchwatch.org/>
<http://www.insecta-inspecta.com/butterflies/monarch/>
<http://www.adver-net.com/Monemerg.html>
www.learner.org/jnorth
www.monarchwatch.org
www.naba.org
www.butterflywebsite.com
http://www.mesc.usgs.gov/resources/education/butterfly/bfly_intro.asp
<http://micro.magnet.fsu.edu/optics/olympusmicd/galleries/butterfly/index.html>

Mosquito

<http://www.mosquitoes.org/LifeCycle.html>
<http://www.ivyhall.district96.k12.il.us/4th/kkhp/1insects/mosquito.html>
<http://mosquito.who.int/docs/fieldtech1.htm>
<http://www.montgomerycountymd.gov/mcgtmpl.asp?url=/content/dep/mosquito/facts.asp>
<http://www.knoxcounty.org/health/mosquitofacts.html>

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<http://insected.arizona.edu/spiderinfo.htm>
<http://www.sedl.org/scimath/pasopartners/spiders/background.html>
<http://www.spiders.com/info/index.jsp>
http://www.landcareresearch.co.nz/education/insects_spiders/spiders/
<http://www.xs4all.nl/~ednieuw/Spiders/Info/spiderinfo.htm>
<http://ohioline.osu.edu/hyg-fact/2000/2060.html>
<http://www.amonline.net.au/spiders/>

<http://www.spiderroom.info/index.html>

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<http://www.ivyhall.district96.k12.il.us/4th/kkhp/1insects/walkingstick.html>

<http://www.pma.edmonton.ab.ca/natural/insects/projects/stickins.htm>

<http://www.earthlife.net/insects/phasmida.html>

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<http://insects.tamu.edu/fieldguide/cimg243.html>

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<http://www.entomology.umn.edu/cues/dx/bugs/pretab7.htm>

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<http://www.nsis.org/butterfly/butterfly-sp-brush-viceroy.html>

<http://entweb.clemson.edu/museum/buttrfly/local/bfly12.htm>

<http://www.floridata.com/tracks/butterfly/viceroy.htm>

http://whyfiles.org/129sci_fable/4.html

<http://www.naturalplanet.org/lessons/monarch-viceroy.htm>

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<http://entweb.clemson.edu/museum/beetles/local/btle52.htm>

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