

(Introduce yourself to the class as a pest management professional.) In my job, it is important that I understand a bit about how insects can hurt us and how they can help us. Today we'll spend some time learning about insects and arthropods.

While I get set up, please take your handout and circle the answers on the pre-test. Don't worry, this isn't for a grade. It just helps me to know how much you know and learn about insects and arthropods. When the presentation is complete, I will ask you to turn over your paper and take the post test.

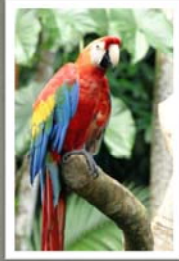
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What is your favorite animal?

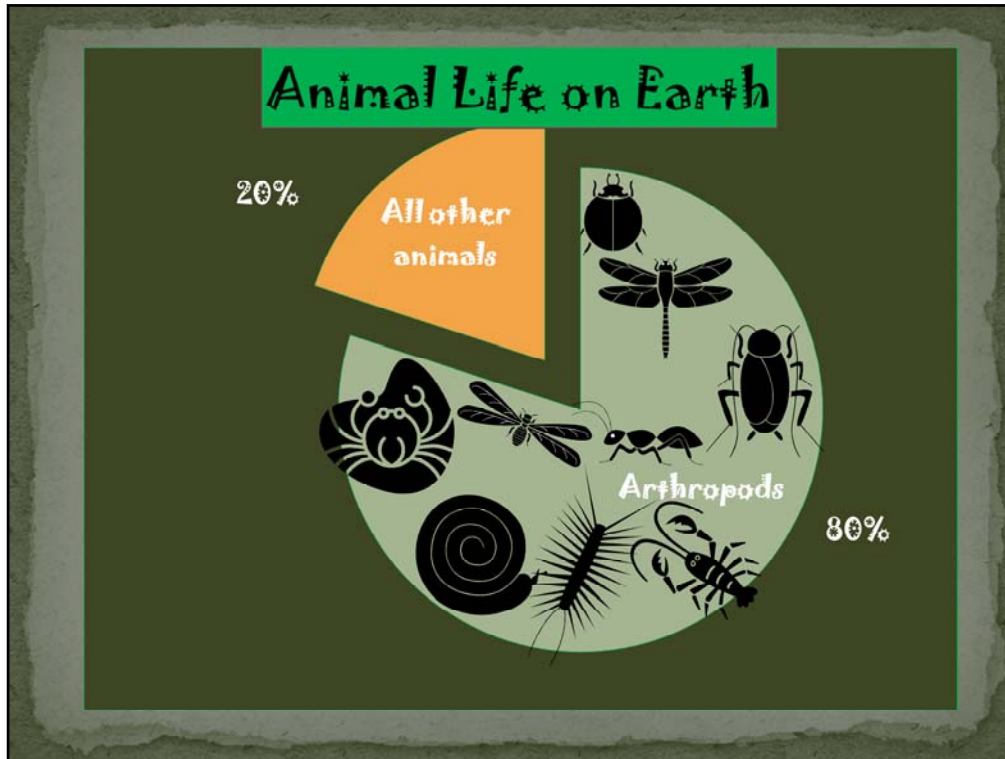


To get us started today, I am going to need your help. Could a few of you raise your hand and tell me what your favorite animal is? (Common answers include horses, cats, dogs, and dolphins.) [Click to bring up photos of animals.] Alright, can you tell me what these animals have in common? (They are animals, they can be pets, they have hair/fur, etc.)

What about the legs?

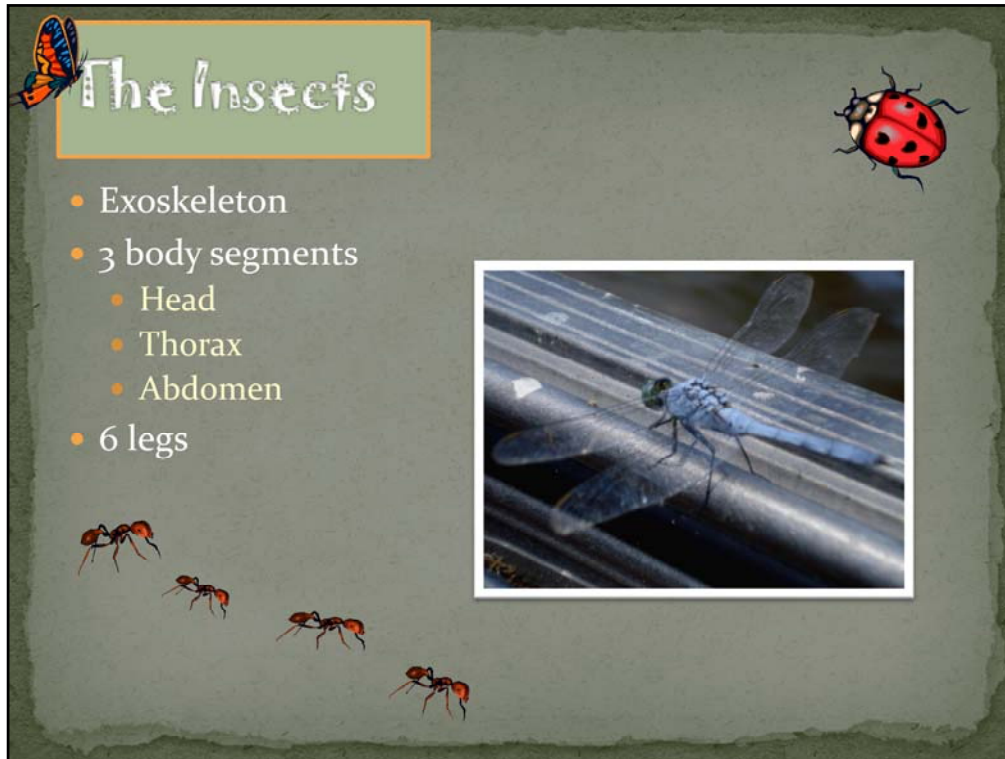


Did any of you consider how many legs they have? What about a horse? How many legs does that have? (4) What about a parrot? (2 legs and 2 wings) How about a dolphin or fish? (0) How about people? (2 legs and 2 arms) Did any of you consider animals with more than 4 legs?



Many animals with more than 4 legs are called arthropods. Arthropods have jointed feet and multiple body segments. Did you know that of all living organisms, people included, 80% are arthropods and only 20% are all other animal life. That is 8 out of every 10 animals on Earth. If we were all animals in this classroom, how many would be arthropods? (If 20 in the classroom, then 16.)

Can you name an arthropod? You would think we would see them everywhere we looked, but they aren't large like elephants or whales. They are pretty small as far as animals go. Some examples include millipedes, centipedes, roly-polies, crabs, lobsters, shrimp, and insects. Arthropods are pretty cool animals. They wear their skeletons on the outside. We call this an exoskeleton. What kind of skeleton arthropods have? (an exoskeleton)



One special group of arthropods are called insects. Okay, we know they are arthropods. Does anyone know what arthropod means? I gave you a clue earlier. It has to do with their legs. Arthro means jointed and pod means feet. Arthropod means jointed feet. Can you move your joints? We have joints in our feet, but we aren't arthropods. What is one thing you just learned that makes us different from arthropods? (We have an endoskeleton and we only have two feet. Arthropods have more than 4 legs and have an exoskeleton.) Now back to insects. Insects are a special group of arthropods that have an exoskeleton, 6 legs, and 3 body segments. Those three body segments are called the head, thorax, and abdomen. What do you think the head is for? (Eating, seeing, smelling with antennae – Not noses, = sensory perception) How about the thorax? The thorax is used for locomotion. This is where the legs and wings attach. How many wings did we say an insect has? (6) What about the wings? (0, 2, or 4) All those legs and wings are attached to the thorax. Think about all the muscles it takes to move all those legs and wings. Whew! Now what about the last segment, the abdomen? That is where all the guts are. (Ewwww). (Digestive system, reproductive system, etc.) There you have it. An insect has an exoskeleton, 3 body segments, and 6 legs.

Insect Development

- No metamorphosis
- Incomplete or gradual metamorphosis
- Complete metamorphosis



Insects have a really neat way of growing. Just like a snake, they have to shed their skin and make new larger skin. This is called molting. The process of molting that results in a change in appearance is known as metamorphosis. Insects have three kinds. No metamorphosis, which means no change, incomplete metamorphosis which is a gradual change and complete metamorphosis which is a drastic change.

No Metamorphosis

- Silverfish
- Young look like small adults.
- They keep molting.



Insects that don't change very much between the young and the adult stages are called ametabolous or without metamorphosis. The silverfish is an example. The young look like the adults only smaller. They keep molting throughout their life.

Incomplete Metamorphosis

- Grasshoppers, cockroaches, praying mantids, walking sticks, true bugs, bed bugs, termites, dragonflies
- Young look like adults, but don't have wings. The young are called nymphs.
- Adults generally have wings and can reproduce.
- Molting stops at adult stage.



Some examples of insects with incomplete or gradual metamorphosis include grasshoppers, cockroaches, praying mantids, walking sticks, true bugs, bed bugs, termites and dragonflies. The young look like adults, but don't have wings. The young are called nymphs.

Adults generally have wings and can reproduce. Molting stops at adult stage. Can you tell which picture is of the nymphs and which is the adult? The adult on the right has wings. Next time you see a cockroach, take a look and see if it has wings. You can tell your parents that if it has wings it is an adult. (You can show the model of the praying mantis here. The praying mantis is hemimetabolous or in other words, has incomplete metamorphosis. Feel free to pass the model around so the students can see the egg mass, the nymphs, and the adult.)

Complete Metamorphosis

- Beetles, flies, butterflies, ant lions, fleas, ants
- Young are worm like and don't look anything like the adult. They are called larvae.
- There is a cocoon stage called the pupae.
- Adults have wings and can reproduce.
- Molting stops at the adult stage



Some examples of insects with complete metamorphosis include beetles, flies, butterflies, ant lions, fleas, and ants. These insects are pretty amazing. The young don't look anything like the adult. The young generally look like worms. You may even know some of the words we use to describe the young. We use words like grubs, maggots, and caterpillars to describe them. After a few molts in the larval stage, the insect forms a cocoon and pupates. While inside the cocoon, something wonderful happens. The insect completely changes from the worm like larva into the adult that has wings. Many times the types of legs and mouth even change. It is pretty amazing. Just think how different a caterpillar is from a butterfly.

Complete Metamorphosis - IO moth



Here are a few more examples of complete metamorphosis. This is an IO moth caterpillar and adult. See how the larva looks different from the adult.

Complete Metamorphosis - ladybug



This is a ladybug. The adult is on the left, the larva on the right and the cocoon or pupa in the middle.

Complete Metamorphosis - Deer fly



Have you ever seen a maggot? Those are the fly larvae. Maggots usually live in moist environments and the adults can fly around to look for food. This adult fly (on left) even has stripes on its eyes that act like sunglasses so it can fly mid-day. (Here you can pass around the ant life cycle model. The students can take a look at the eggs, larvae, pupae, and adult. Did you know that ants made a cocoon?)

Where do insects belong?



Insects can be found in almost every type of environment on earth. (They are not found in the ocean.) They sometimes come in contact with humans. Where do you think insects belong? Inside your home, or outside? (Outside) That's right. We need insects outside. They are vitally important to the food chain and do their job to help the environment by providing animals with food and providing plants with nutrients by decomposing or recycling things like trees and dead plants and animals. Did you know that insects do a lot of recycling. Some insects like flies and cockroaches even love to eat our garbage. Remember how I said that insects are important to the food chain? Can you name some animals that depend on insects for food? (Anteaters, frogs, lizards, bats, birds, shrews, moles, hedgehogs, fish, spiders, other insects, people, even some plants like the Venus flytrap.) Imagine how the earth would change if there were no insects! Let's take a look at how our food would change.



Here in the United States we don't usually eat insects, but we do eat and enjoy things insects make and pollinate. Many of our wildflowers are planted by ants and are pollinated by flies and bees. Wait a minute, do you know what pollination is? It is how flowering plants reproduce. The result of pollination is the fruit of the plant. Honeybees pollinate many fruits and vegetables like squash, blueberries, strawberries, almonds, apples, cucumbers, and melons to name a few. Did you know that insects also make products like red dye that is used in yogurt, make-up and candy? They also make lacquer that is used to protect wood. Of course, the most famous insect made product is . . . Can you guess? (Honey) Just think how different our lives would be without insects. We would have far fewer choices at the grocery store.

(You could provide a taste of honey to the student – with permission of course- or could provide one of the foods mentioned or even some roasted crickets or mealworms. If students have allergies to shellfish, they shouldn't eat insects. You should get permission from the teacher or parents before providing insects as a snack. As an alternative snack, you could provide Nerds®, Good and Plenty®, or Mentos® candies that are colored with Carmine dye from the Cochineal scale insect.)

Insect Pests

- Bite or Sting
- Transmit Disease
- Compete with Humans
 - Food
 - Water
 - Shelter
 - Attention



While insects may be very beneficial, they can become a problem when they bite or sting, transmit disease, or compete with humans for food, water, shelter or attention. Do you know what we call insects that do this? When insects do this we call them pests. Can you name some insects you consider pests? (cockroaches, ants, flies, fleas, head lice, bed bugs, mosquitoes, termites)

Although we don't like pests, keep in mind that a pest is just something that is out of place. A cockroach living in a tree is not a pest, but once it flies into your house or your classroom, it can become one. Our job is to protect our homes, food and ourselves from insect pests. We do this through integrated pest management, or IPM.



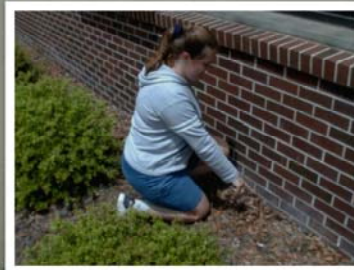
So what should you do if you have insect pests? First, you have to find out why the pests are there in the first place. You may have to call a professional to help. A pest professional is like a detective trying to solve a case. They will gather evidence first and then take action. Your pest professional will evaluate your pest situation by monitoring and identifying your pest. They will then treat for that pest. Some treatments may include cleaning up the area or fixing a door or window screen. Any time you block a pest from coming inside, you call that exclusion. Can you say that with me? (exclusion) Good. Remember, exclusion keeps the pests out. When you clean up an area so pests aren't attracted, that is called sanitation. Would you repeat that with me? (sanitation). Nice job. Sanitation is keeping things clean. Some tools a pest professional uses include their education about the pest biology, a flashlight, a screwdriver, paper and pencil, insect monitors, and pesticides if needed. Pest professionals practicing IPM care about the environment, so they try to use pesticides that target pests where they live and only use pesticides when they are needed. Wow, did you know there was so much to getting rid of pests? Did you realize that cleaning your room and keeping doors closed may help to keep the pests out?

(You can bring some of your tools of the trade to show to the class. If you let the students hold the equipment, be sure it isn't contaminated with a pesticide.)

Be part of the team



- Take a look around and scout for pests.
 - If you see any, report them to your teacher or parents.
 - Be careful around stinging or biting insects.
- Keep your desk and room clean from food, water, and clutter.
- Look for gaps under doors or holes in screens.
 - Report these so they can be fixed.
- Empty outside containers that hold water.
 - A little bit of water can breed mosquitoes.
- Don't store cardboard boxes
 - Insects love to live in them.
- Don't apply pesticides yourself.
Ask an adult or pest management professional.



Here are some things you can do to reduce pests around your school or home. Take a look around and scout for pests. If you see any, report them to your teacher or parents. Make sure to be careful around stinging or biting insects. Keep your desk and room clean from food, water, and clutter. Look for gaps under doors or holes in screens. Report these so they can be fixed. Empty outside containers that hold water. Even a little bit of water can breed mosquitoes. Think about what you have in your yard. Do you have toys that hold water when it rains? If so, be sure to turn them over or put them inside so you don't have a mosquito nursery in your yard.

Another pest friendly area is cardboard. If you have things stored in cardboard boxes, or just have boxes laying around, they easily become home to pests like cockroaches. Take a look around your classroom and your home to find boxes you can clean out and get rid of. Don't let your home be friendly to pests.

Be sure not to apply pesticides yourself. Ask an adult or pest management professional to help out. Pesticides are designed to kill pests so should never be applied by a child.

Review

- Arthropods
 - 80% of all animals
 - Jointed legs and an exoskeleton
- Insects
 - Are arthropods with six legs
 - Have three types of development, no metamorphosis, incomplete metamorphosis or complete metamorphosis
 - Are important recyclers, are crucial to the food chain, and pollinate many foods
- Pests
 - Are in the wrong place
 - Are defeated by IPM
- Humans
 - Need insects in the right place
 - Use IPM to keep pests out


IPM

The slide features a dark green background with a light green starburst containing the acronym 'IPM' in yellow. A photograph of a brown and black cockroach is positioned in the upper right corner. The word 'Review' is written in a white, stylized font at the top center.

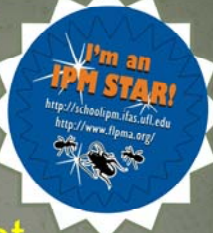
Let's review before we take the post-test. Arthropods make up 80% of all the animals on earth. Arthro means jointed and poda means feet, so an arthropod has jointed feet and an exoskeleton. Can you remember some arthropods? (millipedes, centipedes, roly pollies, crabs, lobsters, shrimp, and insects)

Insects are arthropods with 6 legs. How many legs do insects have? (6) They develop in three different ways, no metamorphosis like the silverfish, incomplete metamorphosis like the cockroach or praying mantis, and complete metamorphosis like a butterfly or ant. Insects are important to the earth and to people. They recycle, they provide food for animals, and pollinate food for people.


Insects can become pests when they get into the wrong place, like in our home, or on our food. We need insects in the right places, like in forests or green spaces, but we use IPM or Integrated Pest Management to keep the pests out of places where we don't want them. Cleaning up food, water, and clutter will go a long way in keeping the pests out.



Thank you!




Please complete your post-test and pass in your papers.




UNIVERSITY of
FLORIDA
IFAS Extension

<http://schoolipm.ifas.ufl.edu>



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FLORIDA PEST
MANAGEMENT
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A stylized blue fly or insect.

<http://www.entfdn.org/>

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I hope you have enjoyed our lesson about helpful and harmful insects and arthropods. Please take this time to fill out your post-test and pass in your papers. I will leave some coloring sheets and stickers with your teacher. Are there any questions?