

What Genes Do



Key Concepts:

- ▶ To understand that, as a result of genetics, offspring are very much but not exactly — like their parents.
- ▶ To define and describe “genes.”
- ▶ To compare and contrast inherited traits using different combinations of genes.

Grade Level: 1–7

Education Subject: Science

Success Indicators:

After participating in this activity learners will be able to:

- ▶ Explain why offspring share some traits with their parents and not others.
- ▶ Define and explain the difference between “dominant traits” and “recessive traits.”

Materials and Methods

Preparation Time: 30 minutes

Lesson Time: 30 minutes

Space: Any

Materials:

- ▶ Pencils or pens
- ▶ Writing paper
- ▶ Five colors of pipe cleaners in two lengths (at least one per learner of each color and length)
- ▶ Ten paper bags
- ▶ Construction paper
- ▶ Markers or crayons
- ▶ Flip chart (or chalkboard or whiteboard)

Background Information:

You’ve probably noticed that offspring often resemble one or both of their parents. This is true for every living thing, whether plant or animal. In the 1860s, Gregor Mendel, an Austrian monk, decided to study pea plants to find out why parents pass along some but not all of their traits to their offspring. He looked at single characteristics — for example, plant height — instead of trying to figure out the whole genetic picture at one time. By working carefully, Mendel discovered the following fascinating facts:

The information for deciding traits is carried in something Mendel called “units” (which we now call “genes”). Genes tell organisms how to build and manage cells. Mendel figured out that parent pea plants each have two units that code for seed shapes, height, color and other characteristics, and that each parent plant passes one unit for each trait to the plants in the next generation. (Mendel didn’t actually see these genes because they’re microscopic, and microscopes hadn’t been invented yet.)

This genetic information keeps its identity from generation to generation. Mendel figured out that parents pass units (genes) to their offspring, which pass the units down to their offspring and so on.

The information for some traits is dominant over that of others. Mendel found that some offspring had unexpected phenotypes, or physical traits. He explained this by using the terms “dominant” and “recessive.” A dominant unit (gene) is always expressed in offspring. A recessive unit (gene) may or may not be.

Instructions:

Preparation time:

1. Read the activity and gather the supplies from the materials list.
2. Recreate the chart that follows on a flip chart or the chalkboard or whiteboard.

Building a Person From the Genes Up

Pipe cleaner color	Trait	Dominant (long pipe cleaners)	Recessive (short pipe cleaners)
Red	Eye color (Br/br)	Brown eyes	Blue eyes
Blue	Tongue-rolling ability (To/to)	Can roll tongue	Cannot roll tongue
White	Earlobe attachment (E/e)	Attached	Unattached
Yellow	Gender (XX/Xy)	2 longs = female, 1 long + 1 short = male	
Green	Number of fingers (F/f)	Five	Six or more fingers

3. Label and fill 10 bags, five representing Mom's genes and five representing Dad's genes. In each case, the number of pipe cleaners in each bag should equal or exceed the number of learners or teams.

- ▶ **Bag M1** (Mom's eye color genes):
Mom has brown eyes because she received a dominant brown-eye gene from her mom and a recessive blue-eye gene from her dad. Fill the bag with 50 percent long red pipe cleaners and 50 percent short red pipe cleaners.
- ▶ **Bag D1** (Dad's eye color genes):
Dad has blue eyes (recessive). Fill the bag with 100 percent short red pipe cleaners.
- ▶ **Bag M2** (Mom's tongue-rolling ability genes):
Mom can roll her tongue because she received a dominant tongue-rolling gene from her mother and a recessive tongue-rolling gene from her father. Fill the bag with 50 percent long blue and 50 percent short blue pipe cleaners.
- ▶ **Bag D2** (Dad's tongue-rolling ability genes):
Like Mom, Dad can roll his tongue because he received a dominant tongue-rolling gene from his mother and a recessive tongue-rolling gene from his father. Fill the bag with 50 percent long blue and 50 percent short blue pipe cleaners.
- ▶ **Bag M3** (Mom's earlobe attachment genes):
Mom has attached earlobes because she received dominant earlobe attachment genes from both of her parents. Fill the bag with 100 percent long white pipe cleaners.
- ▶ **Bag D3** (Dad's earlobe attachment genes):
Dad also has attached earlobes and also received dominant earlobe attachment genes from both of his parents. Fill the bag with 100 percent long white pipe cleaners.
- ▶ **Bag M4** (Mom's gender genes):
All females have two "X" chromosomes. Fill the bag with 100 percent short yellow pipe cleaners.
- ▶ **Bag D4** (Dad's gender genes):
All males have one "X" and one "Y" chromosome. Fill the bag with 50 percent short and 50 percent long yellow pipe cleaners.
- ▶ **Bag M5** (Mom's finger genes):
Mom has five fingers on each hand and no genes for extra fingers. Fill the bag with 100 percent long green pipe cleaners.
- ▶ **Bag D5** (Dad's finger genes):
Dad has six fingers on each hand because he received two genes for extra fingers from his parents. Fill the bag with 100 percent short green pipe cleaners.

4. Line up the 10 bags on a table or desk at the front of the room.

Lesson time:

1. Tell the learners that they're going to make a human using pipe cleaners. The pipe cleaners will represent the genes that control the various traits their humans will inherit. Tell them that the traits were chosen as examples because they're coded for by single genes, and that many other traits are coded for by more than one gene. These traits are also affected only by the genes and that there are many traits that are affected by both genes and environmental conditions and nutrition as well.
2. Have the learners (or a representative from each team, if they're working in teams) take turns picking one pipe cleaner from each bag.
3. Next have them lay out their pipe cleaners, and using the chart you prepared earlier, determine what traits their humans have. **(Note:** You also could have the students draw their humans, indicating what specific traits are represented.)
4. Have the learners or teams share their humans' phenotype (physical traits) and genotype (genetic) information. Record this information on a flip chart or board.

Check for Understanding:

Ask the group the following questions.

- ▶ **Why do offspring generally look like their parents?** (*Because both parents contribute genes to their offspring.*)
- ▶ **Could two brown-eyed parents have a blue-eyed offspring?** (*Yes. The gene for blue eyes is recessive, but if both parents carry it, their offspring may inherit it.*)
- ▶ **How could Mendel produce a short plant from tall ones?** (*By crossing two plants that both carried the recessive gene for plant height [t].*)
- ▶ **What would happen when two short plants are bred?** (*All of their offspring would be short because it would be genetically impossible for those two plants to produce tall plants. The genes for short plants are recessive, so two parents with the recessive phenotype cannot produce tall offspring — the dominant phenotype.*)
- ▶ **How could you apply the information from this lesson in real life?** (*Livestock producers use genetic information all the time to help them decide which females to breed with which males and which animals to keep and which to cull (remove from the herd or flock). Animals with undesirable recessive traits would be culled.*)
- ▶ **How might environmental factors influence a person's phenotype?** (*Nutrition, exercise and other factors influence wellness and appearance.*)
- ▶ **What environmental factors might change how a human looks or develops?** (*Poor nutrition can affect height, weight, color, strength of bones and teeth, and other traits. Vigorous exercise and play can help develop muscles.*)

Adaptations for learners K-4

To adapt this activity for children aged 5 to 8, follow these steps.

- ▶ Discuss how parents and children are alike.
- ▶ Explain that human bodies and all other living things are made of cells, which contain information that determines how children look.
- ▶ Define the word "genes" as the messengers that carry the information about how people look, much as a child would carry a note to a teacher. Stress that we can't see genes because they are very, very small.
- ▶ Ask how many learners have blue eyes. How many have brown eyes? Other colors? Now give each child a sheet of construction paper that matches his or her eye color, and have him or her make a large eye using this paper. Suggest that learners can draw eyelashes and pupils on the eyes, if they wish. Help them punch a hole near the top of their construction paper eyes.
- ▶ Ask the children to find out their parents' eye colors for the next meeting or class. (Note: adopted children may use their adopted parents' eye color. Explain that all humans are related through common, ancient ancestors.)
- ▶ After the children have discovered their parents' eye colors, have them make appropriately colored construction paper eyes for their parents. Help them punch holes near the tops of their parents' paper eyes, too.
- ▶ Give each child two pieces of string or ribbon and one pencil. Have the learners tie the two parental eye cutouts about 5 centimeters (2 inches) below the pencil, next to each other. (Note: You may need to help some of the younger children tie knots.)
- ▶ Now give each child one longer piece of string and have them tie their own eye cutouts to their pencils so that they hang below the parental ones.
- ▶ Hang the eye mobiles around the room. Discuss the various examples (such as that two brown-eyed parents may make a blue-eyed child or a brown-eyed child, but two blue-eyed parents always make a blue-eyed child).

Michigan Grade Level Content Expectations:

All grades: Generate questions based on observations (S.IP.01.12, S.IP.02.12, S.IP.03.12, S.IP.04.12, S.IP.05.11, S.IP.06.11, S.IP.07.11); communicate and present findings of observations and investigations (S.IA.01.1, S.IA.02.13, S.IA.03.13S.IA.04.13, S.IA.05.13, S.IA.06.13, S.IA.07.13).

Grade 1: Identify characteristics (for example: body coverings, beak shape, number of legs, body parts) that are passed on from parents to young (L.HE.01.11).

Grade 5: Explain that the traits of an individual are influenced by both the environment and the genetics of the individual (L.HE.05.11); distinguish between inherited and acquired traits (L.HE.05.12).

- ▶ **Are the physical characteristics demonstrated in this activity an example of inherited or environmental influence on phenotype?** *(These traits are all example of traits that are 100 percent controlled by genes. So they are all inherited.)*
- ▶ **What is a gene?** *(A hereditary unit that carries and stores the information that helps control various physical, mental and behavioral characteristics in living things.)*
- ▶ **What are recessive genes?** *(Genes that are not expressed when combined with dominant ones.)*
- ▶ **Give some examples of recessive traits in humans.** *(Blue eyes, inability to roll the tongue, unattached earlobes, more than five fingers on each hand.)*

Got Immunity?



Key Concept:

Disease transmission and control

Grade Level: 4–7

Education Subject: Science

Success Indicator:

After completing this lesson, learners will be able to:

- ▶ Describe and define the three ways that diseases spread.
- ▶ Describe the role of immunizations in disease prevention.

Materials and Methods

Preparation Time: 20 minutes

Lesson Time: 45 minutes

Space:

- ▶ Germ Keep Away Game: Any
- ▶ Immunity Challenge Game: Open field (such as an athletic field or gymnasium) or open classroom

Materials:

- ▶ Disease cards (equal numbers of the three cards, with enough total cards for half the learners)
- ▶ A hat or small container
- ▶ Bandanas (at least one per learner)
- ▶ Same-sized, lightweight balls or balloons (three to five per learner)

Instructions:

Preparation time:

1. Read through the activity and gather the supplies in the materials list. You may want to make a handout of the vocabulary list.
2. Photocopy, cut apart and fold over the disease cards. Put the cards in the hat or other small container.

Lesson time:

1. Tell the learners that this lesson is going to focus on how diseases are spread and how immunizations can help slow or prevent the spread of diseases. Ask them the following questions:

What makes disease spread through a group of animals?

What are some things that humans do to prevent the spread of disease?

2. **The Germ Keep Away Game.** Explain to the group that they'll be playing the Germ Keep Away Game, which demonstrates a few of the many ways that diseases spread. The game focuses on transmission by contact with:
 - Infected animals (touch).
 - Droplets in the air (air).
 - Insect bites (insect).
3. Divide the class into two groups: "diseases" and "animals."
4. Have each person in the disease group draw one disease card from the hat without showing it to anyone else.
5. Have the animal group huddle and decide on one tactic to prevent the spread of each mode of disease (such as quarantining animals that are sick to prevent infection from diseases that are spread by touch, providing adequate ventilation in barns to prevent infection from diseases that are spread by droplets in the air, and using flea and tick preventives to prevent infection from diseases that are spread by insect bites). Have the group develop a hand signal for each of the prevention measures that the members identify.
6. Next have the disease group spread out across the room. After they're settled, tell the animal group to walk around the diseases until you say "stop" — then they must move to the closest person in the disease group. If two or more members of the animal group are close to the same disease group member, have one of them move to someone else.

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Adapted from the 4-H Science Toolkit: Animal Science Lesson Plan series developed by Cornell Cooperative Extension, Ithaca, NY.

Vocabulary:

Antibody – A blood protein made by cells of the immune system to fight infection.

Antigen – A substance that, when introduced into the body, stimulates the production of an antibody.

Disease – An abnormal condition of an animal's body that causes it to function improperly. Rabies is one example of a serious disease that affects animals and humans. If animals and humans are not protected with a rabies vaccination and they are infected with the disease, they can die from it.

Immunity – A medical term that describes having strong enough biological defenses to prevent disease or infection.

Infection – The damaging growth of an invading organism. In an infection, the infecting organism lives and multiplies inside its host. The infecting organism is also called a pathogen.

Pathogen – Typically a microscopic organism, or germ. Types of pathogens include bacteria, parasites, fungi, viruses, prions and viroids.

Vaccine – Injection of a live, weakened or killed microbe into a human or animal to stimulate the person's or animal's immune system against the microbe, preventing disease. Vaccinations are also called immunizations.

Virus – Ultramicroscopic infectious agents that replicate themselves only within the cells of living hosts; many cause disease.

7. When each animal is paired with a disease, tell the learners that on the count of three, those with disease cards will reveal their cards and the animal learners will show one prevention sign. If the preventive measure the animal person is signaling is effective against the type of disease transmission of the person he or she is paired with, then the animal moves on to the next round. If the preventive measure is not effective against that type of disease transmission, then the animal gets sick and must sit out the next round.
8. Play until everyone gets sick! Then switch animals and diseases and play again.
9. After the second round, discuss with the group how an animal could develop immunity against various diseases (immunizations, developing natural antibodies either from being exposed to the disease and recovering, or from drinking its mother's milk).
10. The Immunity Challenge. Now tell the group they're going to play a game called "The Immunity Challenge," which demonstrates how vaccinations work in an animal's immune system. (For example, through the vaccination process, an animal can build up specific antibodies to help fight off certain diseases. Antibodies provide an animal with a level of protection, but booster shots and revaccination may be required, depending on the situation.)
11. Create boundaries for the play area that provide enough space for learners to escape the disease agents. Set up a veterinary clinic by placing bandanas in a box at one end of the field. On the sidelines at about midfield, scatter the balls or balloons.
12. Tell the group that the bandanas are the vaccinations and the balls are the antibodies. Select one or two learners for about every 10 players to be diseases. Send the remaining learners (the animals) to the opposite end of the field from the vet clinic.
13. Tell the animals that their goal is to avoid the diseases on their way to the vet clinic to receive a vaccination. Explain that if they make it to the vet clinic without being nabbed by a disease, they can tie a bandana around one arm to indicate they've been vaccinated. Once an animal has been vaccinated, it can begin to collect antibodies (the balls or balloons). An animal can collect as many antibodies as it can carry. Try to have at least two antibodies available per animal.
14. Point out that, while the animals are trying to make it to the vet clinic, the diseases will be trying to tag them. Animals who have not been vaccinated and are tagged by a disease must sit out (be quarantined) because they are now contagious. Animals that have been vaccinated and have collected antibodies can have those antibodies knocked away by diseases. (Note: Diseases may not carry antibodies.)

15. If a vaccinated animal loses all the antibodies it has collected, it must return to the vet clinic for a booster. A vaccinated animal that gets tagged when it has no antibodies must go into quarantine for 2 minutes.
16. After 10 or 15 minutes, stop the game and appoint new diseases. Try to end the game while everyone is still having fun.

Check for Understanding:

Bring the group back together and ask the following questions:

- ▶ What are the three ways that diseases spread?
- ▶ What does it mean if an animal is immune to a disease?
- ▶ How do vaccines protect animals?
- ▶ What are antibodies?

Learn More:

- ▶ National 4-H Council's Veterinary Science Helper's Guide: <http://www.4-hmall.org/Product/4-hcurriculum-veterinary-science/08051.aspx>.
- ▶ PAWSitively Youth: A Guidebook About Dogs for Community Outreach Leaders. (2008). D. Palmer, E. Noble and B. Wiesen. Ithaca, N.Y.: Natural Resource, Agriculture and Engineering Service. Online at nraes.org.
- ▶ U.S. Centers for Disease Control and Prevention's "Vaccines and Immunizations" section at <http://www.cdc.gov/vaccines/>.
- ▶ FAQ: Methods of disease transmission. (2007). Toronto, Canada: Mount Sinai Hospital, Department of Microbiology. Accessed from <http://microbiology.mtsinai.on.ca/faq/transmission.shtml>.
- ▶ Ebola - The Plague Fighters Classroom Activity. NOVA Teachers. (2004). Accessed from pbs.org/wgbh/nova/teachers/activities/2304_ebola.html.

Optional:

Visit with a veterinarian to learn more about the kinds of vaccines that are available to protect your favorite domestic animal.

Have the group simulate a disease outbreak in your town. Discuss what learners would do and where they would go to learn more if such an event occurred.

Michigan Grade Level Content Expectations:

Grades 4-7: Generate scientific questions based on observations (S.IP.04.12, S.IP.05.11, S.IP.06.11, S.IP.07.11); communicate and present/defend findings of observations and investigations (S.IA.04.13, S.IA.05.13, S.IA.06.13, S.IA.07.13).

Grade 4: Share ideas about science through purposeful conversation in collaborative groups (S.IA.04.12).

Grade 5-7: Evaluate data, claims and personal knowledge through collaborative science discourse (S.IA.05.12, S.IA.06.12, S.IA.07.12).

HANDOUT: GOT IMMUNITY?

Disease Cards

Photocopy and cut apart these disease cards, then fold them in half so the words are hidden.



MEANS OF DISEASE TRANSMISSION: Touching an infected animal	MEANS OF DISEASE TRANSMISSION: Droplets in the air	MEANS OF DISEASE TRANSMISSION: Insect bite
MEANS OF DISEASE TRANSMISSION: Touching an infected animal	MEANS OF DISEASE TRANSMISSION: Droplets in the air	MEANS OF DISEASE TRANSMISSION: Insect bite
MEANS OF DISEASE TRANSMISSION: Touching an infected animal	MEANS OF DISEASE TRANSMISSION: Droplets in the air	MEANS OF DISEASE TRANSMISSION: Insect bite

Animal Sense Stations



Key Concept:

Animals have various body structures that serve different functions for their growth, survival and reproduction.

Grade Level: 5–7

Education Subject:
Science

Success Indicator:

After participating in this activity, learners will be able to relate how an animal uses its senses for survival and reproduction.

Materials and Methods

Preparation Time: 30-60 minutes

Lesson Time: 60 minutes

Space: Any

Materials:

For ALL stations:

Make a sign with instructions specific to each station. Instruction signs will help learners work more independently.

Station 1 – Touch:

- ▶ A box with a hand-sized hole on one side
- ▶ Cloth large enough to cover the box
- ▶ Three items, two with similar textures, one with a different texture (such as an apple and a pear having similar smooth textures versus a golf ball with a dimpled texture)

Station 2 – Smell:

- ▶ Film canisters or other small opaque containers (one per learner)
- ▶ Cotton balls (one per canister)
- ▶ A variety of liquid extracts (such as almond, banana, peppermint, vanilla)
- ▶ Water

Station 3 – Hearing:

- ▶ Wire coat hanger with a rubber band tied to each corner (one for each pair of learners)
- ▶ Plastic coat hanger with a rubber band tied to each corner (one for each pair of learners)
- ▶ Something to hang the coat hangers on (a coat rack or even a string stretched across the room)

Station 4 – Sight:

- ▶ Pirate patch (or a large, dark plastic spoon)
- ▶ Party blowers, preferably the kind that don't make noise (one per learner and teacher)
- ▶ Lightweight plastic or rubber fly or a picture of a fly
- ▶ Styrofoam cup (or paper cup with flat bottom)
- ▶ 10-inch-tall, thin column made of cardboard, paper or wood, anchored to a base
- ▶ Masking tape

Instructions:

Preparation time:

1. Read through the activity and gather the supplies mentioned in the materials list.
2. Set up the four “sense stations.”
3. For **Station 1 – Touch**, place the box on a desk or table and place the three items inside it. Then cover the box with the cloth. Make a sign for the station with the following instructions:

Station 1 – Touch

1. Place your hand through the opening in the covered box.
2. Using only the most sensitive tips of your fingers, gently brush against the three items in the box.
3. Think about what those items could be. Keep your guesses a secret.
4. Once everyone has had a first chance to feel the items in the box, take turns touching the items again, using different parts of your hand.
5. Think about which movements of your hand helped you learn more about the items.
6. Think about what animals are especially good at using their sense of touch.

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Adapted from the 4-H Science Toolkit: Animal Science Lesson Plan series developed by Cornell Cooperative Extension, Ithaca, NY.

Optional:

Smell – Dogs and scents: Place three similarly scented items (such as strawberry-scented candles, soap and shampoo) in separate paper lunch bags. Challenge the group to guess what the items are just by smelling them. Point out that a dog could tell the difference between the items just by scent.

Smell – Find two of the same heavily scented items. Hide one item in a confined area (such as a classroom or a marked-off section of a playground). Place the other one in a lunch bag. Have the learners “scent” the item in the lunch bag by sniffing but not looking into the bag. Then have them use their noses to try to locate the hidden item in the designated area.

Hearing – Have the learners sit in a circle and cover their eyes. Make noises in various areas around them and have them point toward the noise. Next have them cover one ear and try to locate the same noises again.

4. For **Station 2 – Smell**, put a small amount of an extract on a cotton ball and place the cotton ball in a film canister. Repeat until you have at least two canisters for each scent (including the water). (If you have an odd number of learners, make one set of three scent canisters.) Code the canisters so that you know which ones contain which scent, but the learners won't. Place the canisters on the station table.

5. Make a sign for the station with the following instructions:

Station 2 – Smell

1. Pick a canister from those available at the table. Remove the lid and carefully sniff what's inside. **Do not touch** what is in the canister!
2. Try to find another student with the same scent. Be sure to check everyone else's scents. There may be more than one match for you!
3. As a group, discuss the various scents. Can you identify the scents? Could one of the scents be something that humans can't smell but animals can?
4. Think about what animals are especially good at using their sense of smell.

6. For **Station 3 – Hearing**, gather one wire coat hanger and one plastic coat hanger for each pair of learners in your class. Tie rubber bands to both corners of each hanger. Place the hangers on a table, or hang them on a coat rack or on a string stretched across part of the room.

7. Make a sign for the station with the following instructions:

Station 3 – Hearing

1. Work with a partner. While your partner holds the wire coat hanger by the hook, pick up the end of each rubber band, one end in each hand.
2. Hold the ends of the rubber bands to your ear while your partner taps the straight edge of the hanger. Does it make a difference in what you hear if you hold the rubber band loosely or stretch it tight?
3. Repeat the process with the plastic hanger. Were the results different this time? Why or why not?
4. Trade positions and repeat both experiments so your partner can hear what happens.
5. Think about what animals are especially good at using their sense of hearing.

8. For **Station 4 – Sight**, you'll need to try out the fly zapping yourself to estimate how far back to place the mark that the learners will stand behind as they try to knock the fly off its perch. The goal is to make it challenging but possible for the learners to zap that fly!

Try it first with the cup on the ground and the fly on top of it, then with the fly on top of the column.

9. Place masking tape X's on the floor where the flower and the column will sit and a masking tape line behind which the learners should stand.
10. Make a sign for the station with the following instructions:

Station 4 - Sight

1. Use the pirate patch to cover one eye. Stand at the mark and bend or squat (do not lean forward) so that you can use the party blower to knock the fly off the Styrofoam cup.
2. Now try it again with the other eye covered.
3. Next, try it with both eyes uncovered. Which way was it easiest for you?
4. Finally, use your least successful strategy and try to knock the fly off the tall, skinny column. Was it easier or harder to knock the fly off the column than off the Styrofoam cup? Why?
5. Think about what animals are especially good at using their sense of sight.

Lesson time:

1. Read aloud or paraphrase the following:

Today you will be asked to solve some mysteries. At each of four stations, you'll complete an activity and unravel clues to determine which animal the activity relates to, the same way investigators do who use clues to solve crimes or figure out what happened at an accident scene. Your goal will be to explore animal physiology by using skills of observation (that is, watching) and inference (that is, coming to a conclusion by deductive reasoning from a set of facts instead of from observation). Physiology is how all the parts of living bodies (such as organs, tissues and cells) function.

2. Next, ask the group the following questions:

Do you think animals have the same senses as other animals or the same senses that humans have?

Do they all hear the same, smell the same and see the same?

What differences have you noticed in various kinds of animals' eyes, ears, noses and tongues?

3. Review the instructions at each station and answer any questions the learners may have. Split the class into four stations and send each group to one of the stations. Tell them they'll have 10 minutes to complete the tasks at each station.
4. After 10 minutes, or if all of the learners seem to have completed the tasks at a station, have the groups move on to the next station.

Vocabulary:

Senses: The method animals use to detect what is going on in their environment: seeing, hearing, touching, smelling and tasting.

Physiology: The study of how living bodies function; how organs, tissues, cells and body parts work together.

Inference: The act of drawing a conclusion by deductive reasoning from given facts, instead of from direct observation.

5. After each group has visited each station, bring the large group back together.

Check for Understanding:

- ▶ What do you think the three things in the box are? Why do you think that?
- ▶ Which movements of your hand helped you learn more about the items?
- ▶ Can you name one of the scents you smelled in the canisters?
- ▶ Could one of the scents be something that humans can't smell but animals can? What might that be?
- ▶ How were the sounds you heard different when you held the rubber band loosely or stretched it tight?
- ▶ How were the sounds you heard different when you did the experiment with the wire and plastic hangers?
- ▶ Was it easier for you to knock the fly off the flower with your left eye covered, your right eye covered or both eyes uncovered? Why do you suppose that is?
- ▶ Was it easier to knock the fly off the cup or off the column? Why do you suppose that is?
- ▶ What animals are especially good at using their sense of touch? Smell? Hearing? Sight?
- ▶ How might an animal use its senses to help it survive? To help it reproduce? To help it grow?

Remind the group that you told them at the start of the activity that each station represented a different animal. Write a list of potential answers (such as dog, cat, turtle, lizard, fish) on the board or newsprint. Have the learners each find a partner and tell them they'll have three minutes to decide which animals best match which stations. Tell them there can be multiple answers.

Once the discussion dies down, bring the group back together and ask for volunteers to share the animals they think match each station and why. Record their answers on newsprint or on the board.

Michigan Grade Level Content Expectations:

Grades 5-7: Generate scientific questions based on observations, investigations and research (S.IP.05.11, S.IP.06.11, S.IP.07.11); communicate and defend findings of observations and investigations using evidence (S.IA.05.13, S.IA.06.13, S.IA.07.13).

Grade 5: Identify the general purpose of selected animal systems (digestive, circulatory, respiratory, skeletal, muscular, nervous, excretory and reproductive) (L.OL.5.41); describe the physical characteristics (traits) of organisms that help them survive in their environment (L.EV.05.12).

References:

- ▶ *PAWSitively Youth: A Guidebook About Dogs for Community Outreach Leaders.* (2008). D. Palmer, E. Noble and B. Wiesen. Ithaca, N.Y.: Natural Resources, Agriculture and Engineering Service. Available online at nraes.org.
- ▶ *Animal Senses: How Animals See, Hear, Taste, Smell and Feel.* (1999). P. Hickman (author) and P. Stephens (illustrator). Tonawanda, N.Y.: Kids Can Press.
- ▶ *4-H Skills for Life: Pet Pals Series.* (2001). Chevy Chase, Md.: National 4-H Council.
- ▶ *Neuroscience for Kids.* (Updated April 2011). E.H. Chudler. Seattle: Washington State University. Accessed from <http://faculty.washington.edu/chudler/neurok.html>.