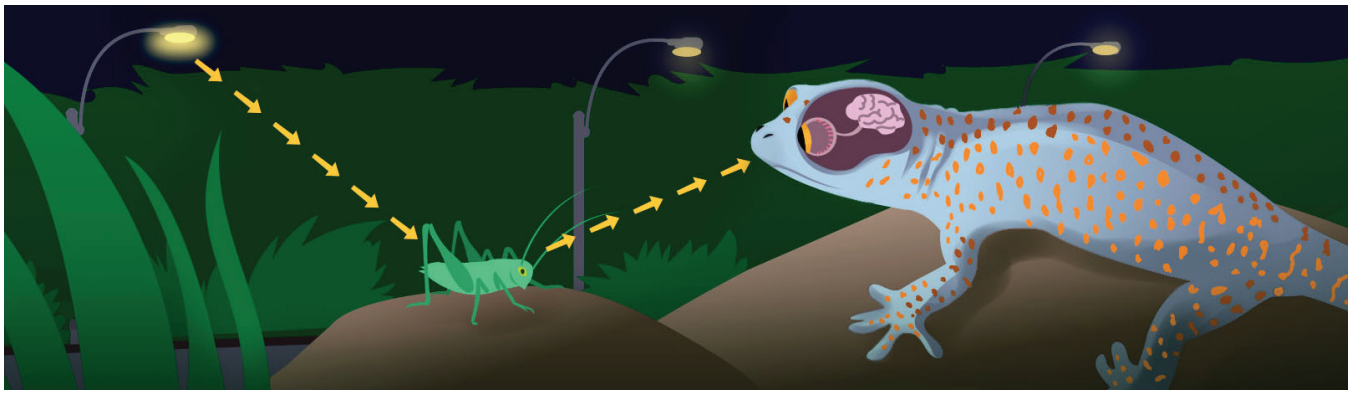
AmplifyScience



Vision and Light:

Investigating Animal Eyes

Investigation Notebook

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Amplify Science Elementary is based on the *Seeds of Science/Roots of Reading*® approach, which is a collaboration between a science team led by Jacqueline Barber and a literacy team led by P. David Pearson.

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Safety Guidelines for Science Investigations

1. **Follow instructions.** Listen carefully to your teacher's instructions. Ask questions if you don't know what to do.
2. **Don't taste things.** No tasting anything or putting it near your mouth unless your teacher says it is safe to do so.
3. **Smell substances like a chemist.** When you smell a substance, don't put your nose near it. Instead, gently move the air from above the substance to your nose. This is how chemists smell substances.
4. **Protect your eyes.** Wear safety goggles if something wet could splash into your eyes, if powder or dust might get in your eyes, or if something sharp could fly into your eyes.
5. **Protect your hands.** Wear gloves if you are working with materials or chemicals that could irritate your skin.
6. **Keep your hands away from your face.** Do not touch your face, mouth, ears, eyes, or nose while working with chemicals, plants, or animals.
7. **Tell your teacher if you have allergies.** This will keep you safe and comfortable during science class.
8. **Be calm and careful.** Move carefully and slowly around the classroom. Save your outdoor behavior for recess.
9. **Report all spills, accidents, and injuries to your teacher.** Tell your teacher if something spills, if there is an accident, or if someone gets injured.
10. **Avoid anything that could cause a burn.** Allow your teacher to work with hot water or hot equipment.
11. **Wash your hands after class.** Make sure to wash your hands thoroughly with soap and water after handling plants, animals, or science materials.

What Is a Scientific Explanation?

1. It answers a question about how or why something happens.
2. It describes things that are not easy to observe.
3. It is based on the ideas you have learned from investigations and text.
4. It is written for an audience.
5. It uses scientific language.

Name: _____ Date: _____

How Animals Get Information About Their Environment

1. Look at the drawing below. With your partner, discuss the questions on the next page.
2. Record your ideas.

Rain Forest Environment

Name: _____ Date: _____

How Animals Get Information About Their Environment

(continued)

The monkeys sit on a branch high up in the tree. What kind of information can they get from the environment?

_____

_____

_____

How do the monkeys get that information?

_____

_____

_____

Name: _____ Date: _____

Getting Information About the Environment

1. With your group, decide who will be Student A, B, C, or D, and then write each student's name in the correct box.
2. Student A chooses a container. Everyone circles the sense (hear, touch, smell, or see) that Student A will use to observe the object inside the container.
3. Student A hears, touches, smells, or sees the item inside the container.
4. Student A shares what information he or she is getting about the object by using that sense. Everyone records this information. (For the smell, touch, and hear containers, make sure the student wears the blindfold.)
5. Student A guesses what object is in the container and shares that guess with the group. Then he or she can open the lid to check what object is inside.
6. Using the same process, Student B will choose a container and use the sense labeled on it to observe the object inside. Repeat this process two more times so that everyone in the group gets a turn.

Name: _____ Date: _____

Getting Information About the Environment (continued)

Station 1: Student A	Station 2: Student B
Name: _____	**Name:** _____
What sense did Student A use to get information about the object?	What sense did Student B use to get information about the object?
hear touch smell see	hear touch smell see
What information did Student A get about the object?	What information did Student B get about the object?
_____	_____
_____	_____
_____	_____
Station 3: Student C	**Station 4: Student D**
Name: _____	**Name:** _____
What sense did Student C use to get information about the object?	What sense did Student D use to get information about the object?
hear touch smell see	hear touch smell see
What information did Student C get about the object?	What information did Student D get about the object?
_____	_____
_____	_____
_____	_____

Name: _____ Date: _____

Think-Write-Pair-Share: Animal Senses

1. Think about the question below.
2. Record your ideas.
3. Share your ideas with your partner.

How do animals use their senses to get information from their environment?

_____

_____

_____

_____

_____

_____

Name: _____ Date: _____

Daily Written Reflection

Do you think all animals hear, smell, and see in the same way? Why or why not?

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Getting Ready to Read: *Investigating Animal Senses*

1. Before reading the book *Investigating Animal Senses*, read the sentences below.
2. If you agree with the sentence, write an "A" on the line before the sentence.
3. If you disagree with the sentence, write a "D" on the line before the sentence.
4. After you read the book, see if your ideas have changed. Be ready to explain your thinking.

_____ Only scientists do science investigations.

_____ When scientists investigate, they start with a question and then think of ways to test out some possible answers.

_____ Hearing, vision, and taste are the three senses that animals use.

_____ Vision is the best sense that animals can use to learn about their environment.

_____ When you do an investigation, you should change only one thing at a time.

Name: _____ Date: _____

Asking Questions When Reading: *Investigating Animal Senses*

1. As you read the book, record questions you have.

Name: _____ Date: _____

Multiple Meaning Words

Some words can mean more than one thing. For each word in the chart:

1. Read the sentence from the book *Investigating Animal Senses* that uses the word.
2. Read the two meanings the word can have.
3. Decide which meaning the word has in the sentence from the book and circle that meaning.

Word	**Sentence from the book**	**Meaning 1**	**Meaning 2**
sense	It may look at the mealworm and sniff at the same time. How will we be able to tell which **sense** the turtle uses more?	how an animal gets information about its environment	logic
vision	The group thought they had good evidence that the turtle used **vision** to find its food.	a clear idea of what should happen in the future	the ability to see
switch	How will we know what made the difference if we **switch** the food?	to start using something that is different	something that starts or stops electricity when it is moved up and down

Name: _____ Date: _____

Reading Reflection: *Investigating Animal Senses*

1. Choose an animal that the students investigated.
2. Answer the questions below.

Animal: _____

What questions did the students have about this animal?

_____

_____

_____

_____

What did the students do to investigate this animal?

_____

_____

_____

_____

What did the students find out about this animal?

_____

_____

_____

_____

Name: _____ Date: _____

Daily Written Reflection

Imagine you are a field mouse. Why might it be important to be able to get information about what's in your environment?

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Writing About How Animals Use Senses

1. Think about the videos you just watched of animals using their senses.
2. Answer the questions below.

The antelopes ran away when they heard their predator. If an antelope couldn't hear well, how could this antelope know when there is a predator nearby?

_____

_____

_____

_____

The raccoon was using its paws to feel for food in the water. If a raccoon couldn't feel things well, how could this raccoon find its food?

_____

_____

_____

_____

Name: _____ Date: _____

Exploring the Mystery Box

1. Follow the directions in each part to answer the questions below.

Part 1

When it is your turn, look through the eyehole of the Mystery Box. What do you see? Write your answer below and draw it in the box.

_____

_____

Stop here until your teacher says to go to Part 2.

Name: _____ Date: _____

Exploring the Mystery Box (continued)

Part 2

When given the signal, work with your group to figure out the answer to this question: What do you need in order to see the "food" that is inside the box?

_____

_____

With your group, decide one thing you will change about the Mystery Box so that you can see what is inside. Make this change, and then look through the hole to find out if you can see what is inside.

What did you change?

_____

_____

What kind of information did you observe about the object inside the box?

_____

_____

Name: _____ Date: _____

Asking Questions About Light

Record at least two new questions you have about light.

_____

_____

_____

_____

_____

_____

Name: _____ Date: _____

Chapter 1: Check Your Understanding

This is a chance for you to reflect on your learning so far. This is not a test. Be open and truthful when you respond.

Scientists investigate in order to explain how or why something happens. Am I getting closer to figuring out how a Tokay gecko uses its vision and other senses to survive in its environment?

I understand how a gecko uses its senses every day to survive.	____ Yes	____ Not yet
I understand how light allows a gecko to see.	____ Yes	____ Not yet
I understand how light travels from a source to a gecko's eyes.	____ Yes	____ Not yet
I understand what structures are involved in a gecko seeing its prey.	____ Yes	____ Not yet
I understand why the amount of light is important for a gecko to see well.	____ Yes	____ Not yet
I understand that science investigations use a variety of methods, tools, and techniques.	____ Yes	____ Not yet

I think I understand or don't yet understand these ideas because

_____

_____

What are you still wondering about how a gecko sees?

_____

_____

Name: _____ Date: _____

Daily Written Reflection

Think of a time when you had trouble seeing something. What did you have trouble seeing? What did you do to see it better?

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

You can use this page to record notes or create drawings.

Name: _____ Date: _____

Investigating Light

1. Use the *Vision and Light* Simulation to figure out how light allows a predator to see its prey.
2. Use what you observe to answer the questions below.

Investigation 1

Open the Sim. What did you observe when the light is on?

_____

_____

_____

Now turn the light off and observe what happens when the light is off. What did you observe when the light is off?

_____

_____

_____

Investigation 2

Restart the Sim. Change the direction of light by dragging the lamp along the track. What did you observe when the light travels in a different direction?

_____

_____

_____

Name: _____ Date: _____

Investigating Light (continued)

Reflecting on Investigations 1 and 2

What are your ideas now about how light allows a predator to see its prey?

_____

_____

_____

_____

Draw a picture in the box below if it helps you describe your ideas.

Name: _____ Date: _____

Daily Written Reflection

Why might it be important to change only one thing at a time when doing an investigation?

_____

_____

_____

_____

_____

_____

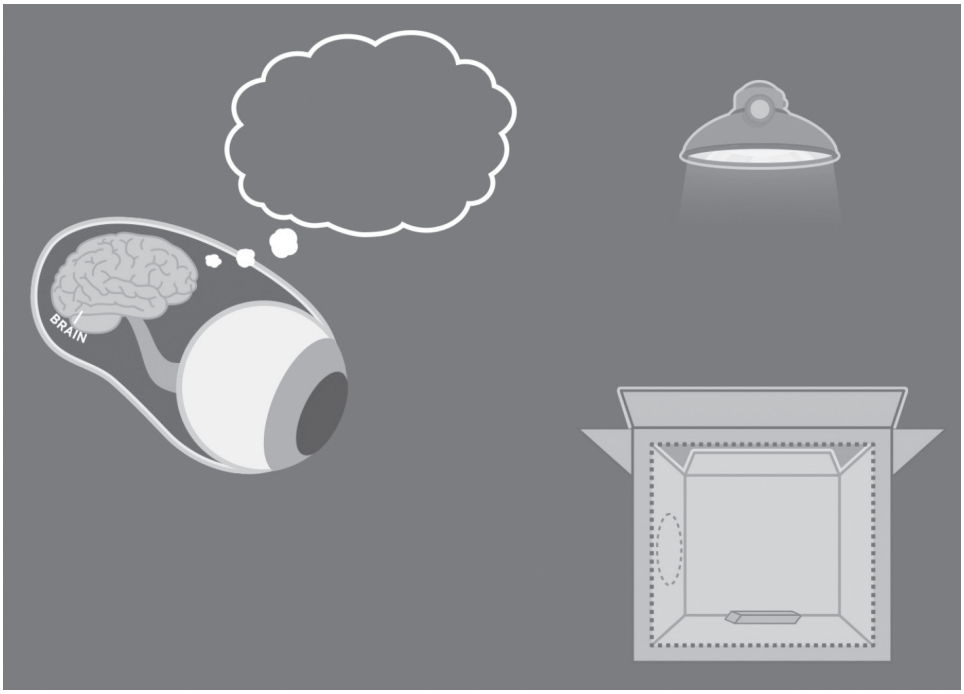
Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Mystery Box Model When the Eyehole Is Blocked

1. Use the Modeling Tool to investigate why you can't see the object inside the Mystery Box when the box lid is open but the eyehole is blocked.
2. Explain why you can't see the object by drawing arrows on the diagram to show where the light goes.
3. Answer the question below the diagram.

Modeling Tool Diagram



Why can't you see the eraser when the eyehole is blocked but the box lid is open and the light is on?

_____

_____

_____

Name: _____ Date: _____

Daily Written Reflection

What are some examples of light sources in your home? Is there a place in your home that is completely dark? How do you know?

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Getting Ready to Read: *I See What You Mean*

1. Before reading the book *I See What You Mean*, read the sentences below.
2. If you agree with the sentence, write an "A" on the line before the sentence.
3. If you disagree with the sentence, write a "D" on the line before the sentence.
4. After you read the book, see if your ideas have changed. Be ready to explain your thinking.

_____ All light stops when it reaches an object.

_____ Light comes from a source and then floats around.

_____ Only shiny things, like spoons and mirrors, reflect light.

_____ We see because light reflects off objects and travels to our eyes.

_____ Light carries information about objects, such as what color and shape they are.

Name: _____ Date: _____

Asking Questions When Reading: *I See What You Mean*

1. As you read the book, record questions you have in the first column.
2. If you find the answers to your questions as you read, record your answers in the second column.

Question	**Information from the book that helps answer my question**

Name: _____ Date: _____

Multiple Meaning Words

Some words can mean more than one thing. For each word in the chart:

1. Read the sentence from the book *I See What You Mean* that uses the word.
2. Read the two meanings the word can have.
3. Decide which meaning the word has in the sentence from the book and circle that meaning.

Word	**Sentence from the book**	**Meaning 1**	**Meaning 2**
mean	I see what you **mean**, but still . . . there must be more to it.	not nice	to have in mind
vision	It made her wonder—how did **vision** work anyway?	the ability to see	a clear idea of what should happen in the future
reflect	The peach **reflects** light from the lamp.	to cause light to bounce off a material	to think back on something

Name: _____ Date: _____

Reading Reflection: *I See What You Mean*

1. Now that you have finished reading *I See What You Mean*, answer the questions below.

Would Jayla be able to see the peach if light from the lamp traveled straight to her eyes? Why or why not?

_____

_____

_____

_____

Would Zoey be able to see the peach if the lamp in the room were not turned on? Why or why not?

_____

_____

_____

_____

Name: _____ Date: _____

Think-Write-Pair-Share: Light and Information

1. Look at the projection of pages 18–19 of *I See What You Mean*.
2. Think about how you would answer the question below.
3. Record your ideas.
4. Share your ideas with your partner.

Jayla can see the peach because light from the peach travels to her eyes. What kind of information about the peach is this light carrying?

_____

_____

_____

_____

_____

Name: _____ Date: _____

Daily Written Reflection

Imagine you are looking at an apple. How does information about the apple get to your eyes?

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Investigating How Light Allows an Animal to See

1. Read each statement below about how a predator can see its prey. Each statement is true in some situations and false in others.
2. Use the Sim to find evidence to explain when each statement is true and when it is false.
3. Record when each statement is true and when it is false on the lines below each statement.

Statement 1: The predator can see its prey when light is turned so that it shines on the prey.

_____

_____

_____

_____

_____

_____

Statement 2: The predator can see its prey when light goes into the predator's eye.

_____

_____

_____

_____

_____

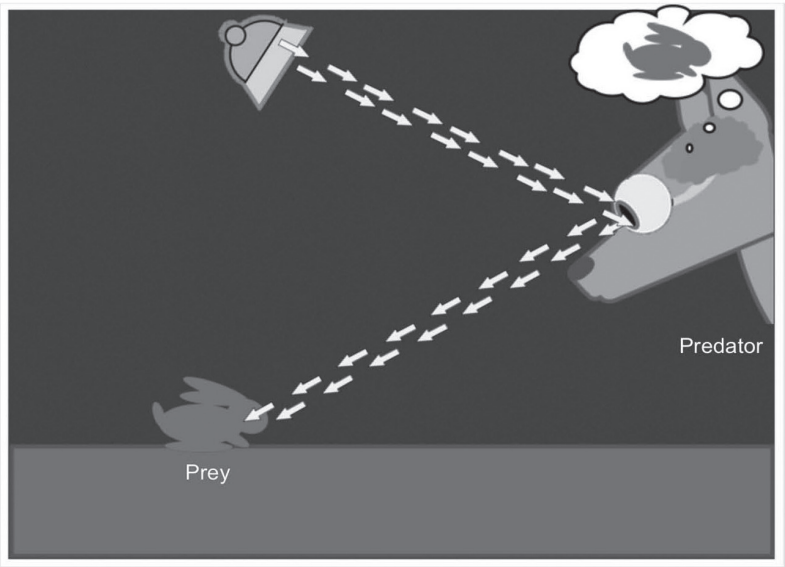
_____

Name: _____ Date: _____

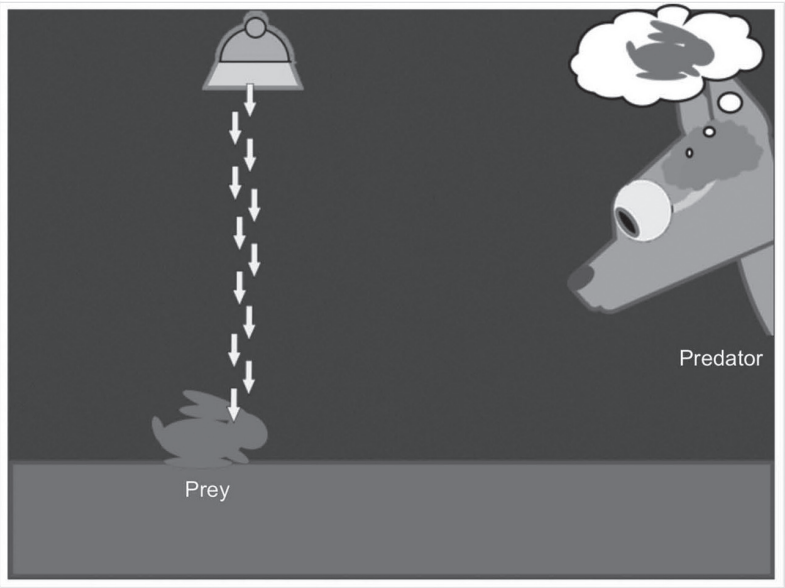
Reviewing Models About Vision and Light

1. Review Models 2 and 3 with your partner. Discuss how each model is incorrect or incomplete and how each could be improved.
2. On the following page, choose either Model 2 or Model 3. Write about how your model is incorrect or incomplete and how it could be improved.

Model 2



Model 3



Name: _____ Date: _____

Reviewing Models About Vision and Light (continued)

I am writing about Model _____.

This model is incorrect or incomplete because

_____

_____

_____

_____

In order to show what actually happens when an animal sees an object, I would improve this model by

_____

_____

_____

_____

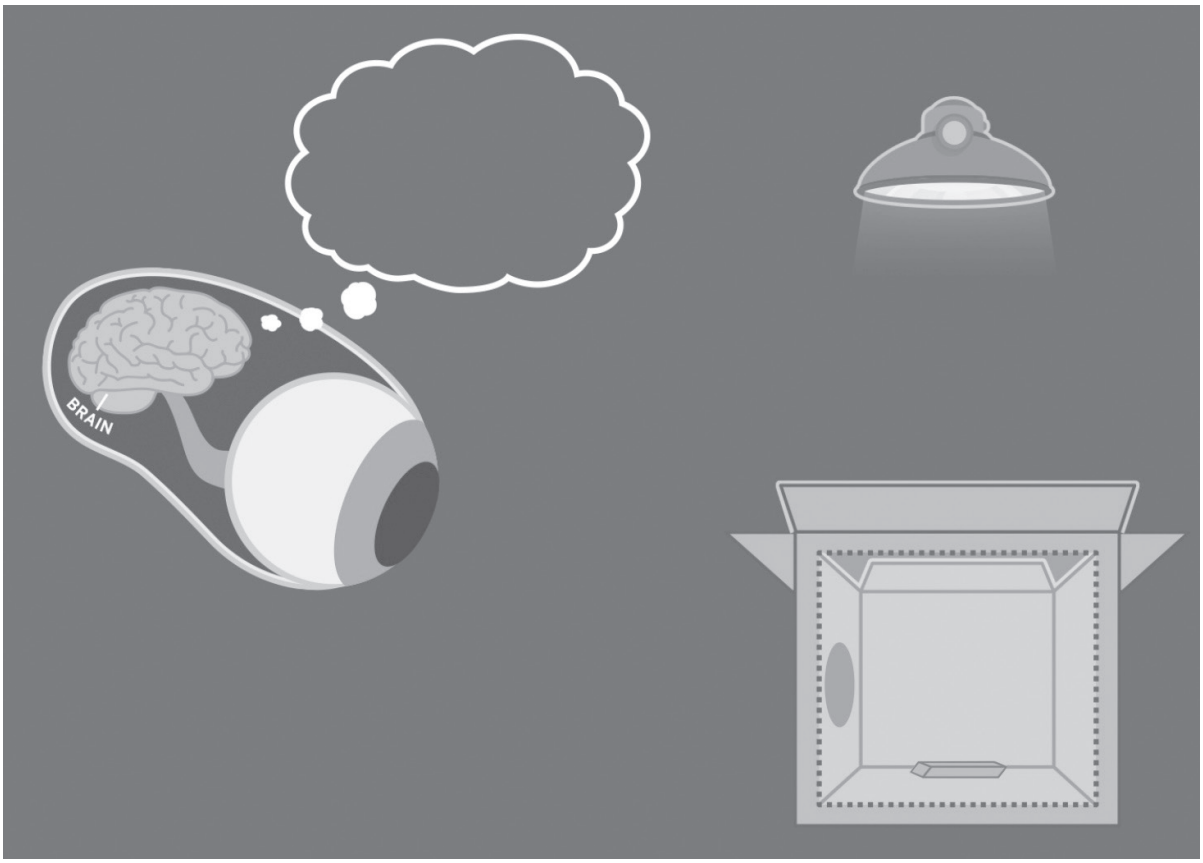
Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Making a Model of the Mystery Box

1. After you complete your models, draw arrows on the diagram below to show your ideas about how light allows someone to see what is inside the Mystery Box.
2. Use the words in the word bank below to label your drawing and explain your ideas.

Word Bank		
object	light source	reflect



Name: _____ Date: _____

Daily Written Reflection

Think about a time when there was a lot of light shining right into your eyes. What did it feel like? What did you see?

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Scientific Explanation of How Light Allows an Animal to See

1. Write a scientific explanation that answers the question below. Be sure to start with the light source.

How does light allow a Tokay gecko to see its prey?

_____

_____

_____

_____

_____

_____

_____

_____

Name: _____ Date: _____

Chapter 2: Check Your Understanding

This is a chance for you to reflect on your learning so far. This is not a test. Be open and truthful when you respond.

Scientists investigate in order to explain how or why something happens. Am I getting closer to figuring out how a Tokay gecko uses its vision and other senses to survive in its environment?

I understand how a gecko uses its senses every day to survive.	____ Yes	____ Not yet
I understand how light allows a gecko to see.	____ Yes	____ Not yet
I understand how light travels from a source to a gecko's eyes.	____ Yes	____ Not yet
I understand what structures are involved in a gecko seeing its prey.	____ Yes	____ Not yet
I understand why the amount of light is important for a gecko to see well.	____ Yes	____ Not yet
I understand that science investigations use a variety of methods, tools, and techniques.	____ Yes	____ Not yet

I think I understand or don't yet understand these ideas because

_____

_____

What are you still wondering about how a gecko sees?

_____

_____

Name: _____ Date: _____

Daily Written Reflection

In what ways have you been like a scientist during this unit?

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Investigating Animal Structures

1. Open the Sim in Recognizing Prey mode.
2. Adjust the light so the predator can see its prey.
3. Observe what happens after the light gets to the predator's eye.

What did you observe happens after the light gets to the predator's eye?

_____

_____

_____

_____

_____

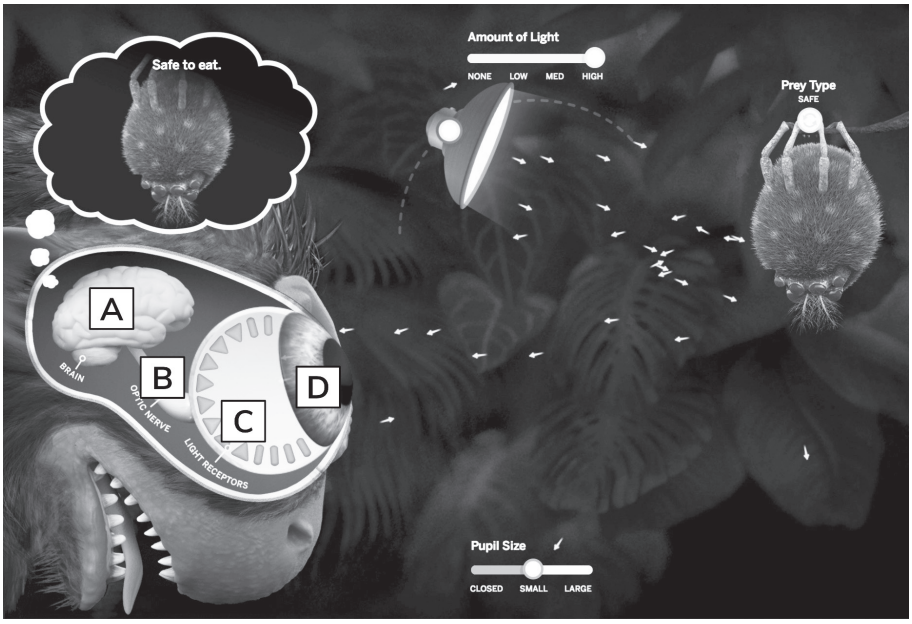
_____

_____

Name: _____ Date: _____

How Animals' Structures Help Them See

1. Match the label on the diagram below with the statement that describes what happens at each of the body structures when the predator is able to see its prey.
2. Circle the appropriate letter.



1. Light, which carries information, enters the predator's eye through the pupil.
   This happens at (circle one) A B C D

2. Information from light gets to the light receptors at the back of the predator's eye.
   This happens at (circle one) A B C D

3. Information is sent from the light receptors, through the optic nerve, to the brain.
   This happens at (circle one) A B C D

4. The predator's brain forms an image of the prey.
   This happens at (circle one) A B C D

Name: _____ Date: _____

Daily Written Reflection

Think of a time that you recognized something that you saw or heard. Why was it helpful for you to recognize it? Describe what you saw or heard and how it was helpful to recognize what it was.

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Getting Ready to Read: *Crow Scientist*

1. Before reading the book *Crow Scientist*, read the sentences below.
2. If you agree with the sentence, write an "A" on the line before the sentence.
3. If you disagree with the sentence, write a "D" on the line before the sentence.
4. After you read the book, see if your ideas have changed. Be ready to explain your thinking.

_____ Humans are part of a crow's environment.

_____ All humans look the same to a crow.

_____ A crow's eye has pupils that let in light and light receptors that respond to light.

_____ A crow's brain is not big enough to hold memories.

_____ If scientists change more than one thing in their investigation, they can still figure out what makes a difference.

Name: _____ Date: _____

You can use this page to record notes or create drawings.

Name: _____ Date: _____

Asking Questions When Reading: *Crow Scientist*

1. As you read the book, record questions you have in the first column.
2. If you find the answers to your questions as you read, record your answers in the second column.
3. In the third column, think of other ways you could investigate your questions.
4. On the next page, record any new questions you have after reading.

Question	**Information from the book that helps answer my question**	**Other ways to investigate my question**

Name: _____ Date: _____

Asking Questions When Reading: *Crow Scientist* (continued)

New Questions

Name: _____ Date: _____

Multiple Meaning Words

Some words can mean more than one thing. For each word in the chart:

1. Read the sentence from the book *Crow Scientist* that uses the word.
2. Read the two meanings the word can have.
3. Decide which meaning the word has in the sentence from the book and circle that meaning.

Word	Sentence from the book	Meaning 1	Meaning 2
test	Marzluff thought of a way to **test** this.	questions that are used to find out what you know about a topic	to do something in order to find out if an idea is true
face	Will crows recognize the **face** of a dangerous human?	the part of your head that has two eyes, a nose, and a mouth	to turn your body toward something or someone

Name: _____ Date: _____

Reading Reflection: *Crow Scientist*

1. Now that you have finished reading *Crow Scientist*, answer the questions below.

John Marzluff figured out that crows recognize human faces. How does this help crows survive?

_____

_____

_____

_____

How did the masks help Marzluff with his investigation?

_____

_____

_____

_____

Name: _____ Date: _____

Daily Written Reflection

Imagine you are going to investigate whether crows can recognize human voices. How could you investigate this question? What variable would you change? Why would you change this variable?

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

You can use this page to record notes or create drawings.

Name: _____ Date: _____

Seeing Different Prey in the Sim

1. Open the Sim and choose Recognizing Prey mode from the menu.
2. Follow the directions in each part to answer the questions.

How does the predator in the Sim tell the difference between two types of prey?

Part 1

1. Press PLAY in the Sim. Change the amount and direction of light so that the predator is able to see the prey well.
2. Observe what the predator sees. Pay careful attention to which of the predator's body structures helped the predator see the prey.
3. Switch the type of prey from safe to toxic by pressing on the circle above the prey. Keeping the angle and amount of light the same, repeat Step 2.
4. Answer the questions below.

How are the two kinds of prey different?

_____

_____

Which of the predator's body structures helped the predator tell the difference between the two types of prey?

_____

_____

Describe how these body structures helped the predator see the prey.

_____

_____

_____

Name: _____ Date: _____

Seeing Different Prey in the Sim (continued)

Part 2

1. Select the safe prey again and press PLAY.
2. Change the amount and direction of light so that the predator is able to see the prey well.
3. Write down your observations about how the predator reacts to the prey.
4. Select the toxic prey and repeat Step 3. Be sure to keep the angle and amount of light the same.

What did you observe about how the predator reacts to the safe prey?

_____

_____

_____

What did you observe about how the the predator reacts to the toxic prey?

_____

_____

_____

Name: _____ Date: _____

Asking Questions

What questions do you have about how animals know what they are looking at?

_____

_____

_____

_____

_____

_____

Name: _____ Date: _____

Daily Written Reflection

Imagine you are late to school and you walk into your classroom. You observe that no one is there. What would you decide to do? Why?

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

How the Lizard Recognizes Its Prey

1. After you complete your model with the Sorting Tool, answer the questions below.

Would the lizard be able to see the prey if the light was not able to get from the prey into the lizard's eye? Explain why or why not.

_____

_____

_____

_____

How do you think the lizard would react to seeing this insect if it had never seen this type of insect before?

_____

_____

_____

_____

Why is seeing and recognizing prey important to the lizard's survival?

_____

_____

_____

_____

Name: _____ Date: _____

Think-Write-Pair-Share: Animal Reactions

1. Think about the question below.
2. Record your ideas.
3. Share your ideas with your partner.

How do animals know how to react when they get information about their environment?

_____

_____

_____

_____

_____

Name: _____ Date: _____

Daily Written Reflection

Why is it important for animals to see what is in their environment? Choose an animal and provide a specific example of why that animal needs to see.

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Recognizing the Object in the Mystery Box

1. After completing your model, discuss the following questions with your partner.
2. Write your answers on the lines below.

How would you know that the object in the Mystery Box is a piece of cake?

_____

_____

_____

_____

How would you react if you saw the piece of cake in the Mystery Box?

_____

_____

_____

_____

Name: _____ Date: _____

Scientific Explanation of How Animals Know What They Are Looking At

1. Write a scientific explanation that answers the question below. To provide a complete explanation, you will need to include information about
   - how a Tokay gecko's structures allow it to see its prey.
   - how a Tokay gecko knows how to react when it sees its prey.

How does a Tokay gecko know that it is looking at its prey?

_____

_____

_____

_____

_____

_____

_____

_____

Name: _____ Date: _____

Chapter 3: Check Your Understanding

This is a chance for you to reflect on your learning so far. This is not a test. Be open and truthful when you respond.

Scientists investigate in order to explain how or why something happens. Am I getting closer to figuring out how a Tokay gecko uses its vision and other senses to survive in its environment?

I understand how a gecko uses its senses every day to survive. ____ Yes ____ Not yet

I understand how light allows a gecko to see. ____ Yes ____ Not yet

I understand how light travels from a source to a gecko's eyes. ____ Yes ____ Not yet

I understand what structures are involved in a gecko seeing its prey. ____ Yes ____ Not yet

I understand why the amount of light is important for a gecko to see well. ____ Yes ____ Not yet

I understand that science investigations use a variety of methods, tools, and techniques. ____ Yes ____ Not yet

I think I understand or don't yet understand these ideas because

_____

_____

What are you still wondering about how a gecko sees?

_____

_____

Name: _____ Date: _____

Daily Written Reflection

Think about an animal that has an amazing sense of smell or hearing. How do you know it has an amazing sense of smell or hearing?

Name of animal: _____

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Getting Ready to Read: *Seeing Like a Shrimp and Smelling Like a Snake*

1. Before reading the book *Seeing Like a Shrimp and Smelling Like a Snake*, read the sentences below.
2. If you agree with the sentence, write an "A" on the line before the sentence.
3. If you disagree with the sentence, write a "D" on the line before the sentence.
4. After you read the book, see if your ideas have changed. Be ready to explain your thinking.

_____ All animals have similar kinds of receptors.

_____ All animals need to see in order to find their prey.

_____ A snake can smell with its tongue.

_____ Some animals have a better sense of hearing than other animals.

_____ Humans have better senses than other animals.

Name: _____ Date: _____

Asking Questions When Reading: *Seeing Like a Shrimp and Smelling Like a Snake*

1. As you read the book, record questions you have in the first column.
2. If you find the answers to your questions as you read, record your answers in the second column.
3. In the third column, think of other ways you could investigate your questions.
4. On the next page, record any new questions you have after reading.

Question	**Information from the book that helps answer my question**	**Other ways to investigate my question**

Name: _____ Date: _____

Asking Questions When Reading: *Seeing Like a Shrimp and Smelling Like a Snake* (continued)

New Questions

Name: _____ Date: _____

Multiple Meaning Words

Some words can mean more than one thing. For each word in the chart:

1. Read the sentence from the book *Seeing Like a Shrimp and Smelling Like a Snake* that uses the word.
2. Read the two meanings the word can have.
3. Decide which meaning the word has in the sentence from the book and circle that meaning.

Word	**Sentence from the book**	**Meaning 1**	**Meaning 2**
cool	Seeing in two different directions is **cool**, but how does it help a mantis shrimp survive?	somewhat cold	interesting or fun
process	The touch receptors send information to the mole's brain, which **processes** the information.	to figure out what something is or what it means	a series of actions that make something happen

Name: _____ Date: _____

Reading Reflection: *Seeing Like a Shrimp and Smelling Like a Snake*

1. Choose one animal you read about (star-nosed mole, catfish, fennec fox, snake, or mantis shrimp). Then, return to that section in the book and answer the questions below.

Name of animal: _____

What sense (touch, taste, hearing, smell, or vision) does the book describe for this animal?

_____

What did you learn about this animal's receptors?

_____

_____

_____

How are human senses similar to this animal's senses?

_____

_____

_____

How are human senses different from this animal's senses?

_____

_____

_____

Name: _____ Date: _____

Daily Written Reflection

When you are outside at night, what kinds of things can you see? What are some light sources at night?

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

You can use this page to record notes or create drawings.

Name: _____ Date: _____

Modeling How Different Animals See

1. Complete the Animal 1 Vision model with your partner.
2. Answer the questions for Part 1.
3. Complete the Animal 2 Vision model with your partner.
4. Answer the questions for Part 2.

Part 1

What is Animal 1 looking at?

_____

_____

How well can it see during the daytime, when there is a lot of light?
Circle one:

a. Not very well

b. Just okay

c. Very well

Do you think Animal 1 looks for prey during the daytime? Why?

_____

_____

_____

Name: _____ Date: _____

Modeling How Different Animals See (continued)

Part 2

What is Animal 2 looking at?

_____

_____

How well can it see during the daytime, when there is a lot of light?
Circle one:

a. Not very well

b. Just okay

c. Very well

Do you think Animal 2 looks for prey during the daytime? Why?

_____

_____

_____

Name: _____ Date: _____

Researching Animal Eyes

1. Record the name of the animal that you will research in Box 1.
2. Read the pages about your animal's eyes in *Handbook of Animal Eyes*.
3. Circle when your animal is active and then record information about your animal from the text.
4. Listen carefully as your group members share their research. After they finish sharing, record the most important information about each animal's eyes in Boxes 2–4.

Name: _____ Date: _____

Researching Animal Eyes (continued)

Box 1—Name of animal:	**Box 2—Name of animal:**
_____	_____
This animal is active:	This animal is active:
at night during the day	at night during the day
Information about light receptors:	Information about light receptors:
_____	_____
_____	_____
Other information:	Other information:
_____	_____
_____	_____
_____	_____
Box 3—Name of animal:	**Box 4—Name of animal:**
_____	_____
This animal is active:	This animal is active:
at night during the day	at night during the day
Information about light receptors:	Information about light receptors:
_____	_____
_____	_____
Other information:	Other information:
_____	_____
_____	_____
_____	_____

Name: _____ Date: _____

Daily Written Reflection

In what amount of light do you see best? Describe how it is different trying to see when there is more or less light than this.

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Investigating Animal Vision in Different Amounts of Light

1. Open the Sim and choose Different Predators mode from the menu.
2. Use the Sim to figure out how different predators can see their prey clearly in different amounts of light.
3. Follow the directions in each part to answer the questions.

Part 1: Predator Vision in Bright Light

1. Move the Amount of Light slider to high. Angle the lamp so the light shines on the prey.
2. Press PLAY and observe what the predator sees. Record your observations.

Before Changing Variables in Bright Light

How well could the predator see the prey? (circle one)

Not very well Just okay Very well

Describe what the predator saw. Could it tell if the prey was safe to eat?

_____

_____

_____

3. Press the button to reset the Sim.
4. Move the Amount of Light slider to high. Angle the lamp so the light shines on the prey.
5. Change one variable: receptor sensitivity, pupil size, or type of prey.
6. Press PLAY and observe what the predator sees. Record your observations.

Name: _____ Date: _____

Investigating Animal Vision in Different Amounts of Light

(continued)

Test #1

I reset the Sim and changed _____ to _____.

How well could the predator see the prey? (circle one)

Not very well Just okay Very well

Describe what the predator saw. Could it tell if the prey was safe to eat?

_____

_____

_____

7. Press the button to reset the Sim.
8. Move the Amount of Light slider to high. Angle the lamp so the light shines on the prey.
9. Change one variable: receptor sensitivity, pupil size, or type of prey.
10. Press PLAY and observe what the predator sees. Record your observations.

Test #2

I reset the Sim and changed _____ to _____.

How well could the predator see the prey? (circle one)

Not very well Just okay Very well

Describe what the predator saw. Could it tell if the prey was safe to eat?

_____

_____

_____

Name: _____ Date: _____

Investigating Animal Vision in Different Amounts of Light

(continued)

Part 2: Predator Vision in Low Light

1. Move the Amount of Light slider to low. Angle the lamp so the light shines on the prey.
2. Press PLAY and observe what the predator sees. Record your observations.

Before Changing Variables in Low Light

How well could the predator see the prey? (circle one)

Not very well Just okay Very well

Describe what the predator saw. Could it tell if the prey was safe to eat?

_____

_____

_____

3. Press the button to reset the Sim.
4. Move the Amount of Light slider to low. Angle the lamp so the light shines on the prey.
5. Change one variable: receptor sensitivity, pupil size, or type of prey.
6. Press PLAY and observe what the predator sees. Record your observations.

Name: _____ Date: _____

Investigating Animal Vision in Different Amounts of Light

(continued)

Test #3

I reset the Sim and changed _____ to _____.

How well could the predator see the prey? (circle one)

Not very well Just okay Very well

Describe what the predator saw. Could it tell if the prey was safe to eat?

_____

_____

_____

7. Press the button to reset the Sim.
8. Move the Amount of Light slider to low. Angle the lamp so the light shines on the prey.
9. Change one variable: receptor sensitivity, pupil size, or type of prey.
10. Press PLAY and observe what the predator sees. Record your observations.

Test #4

I reset the Sim and changed _____ to _____.

How well could the predator see the prey? (circle one)

Not very well Just okay Very well

Describe what the predator saw. Could it tell if the prey was safe to eat?

_____

_____

_____

Name: _____ Date: _____

Daily Written Reflection

In the last lesson, you and your classmates shared what you read about animal vision. What questions do you still have about the animals that you learned about? List your questions below.

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Think-Write-Pair-Share: Tarsier

1. Think about the question below.
2. Record your ideas.
3. When your teacher says "share," share your ideas with your partner.

Tarsiers have high-sensitivity light receptors. How does this explain why the tarsier sees well at night but not during the day?

_____

_____

_____

_____

_____

_____

Name: _____ Date: _____

Think-Write-Pair-Share: Squirrel

1. Think about the question below.
2. Record your ideas.
3. When your teacher says "share," share your ideas with your partner.

Squirrels have low-sensitivity light receptors. How does this explain why a squirrel sees well during the day but not at night?

_____

_____

_____

_____

_____

_____

Name: _____ Date: _____

Building a Vision Model

One pair of students will build a Vision Model of an eye with high-sensitivity light receptors and one pair will build a Vision Model of an eye with low-sensitivity light receptors.

1. Decide with your group which pair will build which type of eye to show how animals see and know what they are looking at.
2. Review the available materials and decide with your group what structure and function each material will represent in the Vision Model. You don't need to use all the materials, but you do need to agree on which materials will represent which structure.
3. Record your plan for your Vision Model on page 84, Planning Our Vision Model.

Name: _____ Date: _____

Building a Vision Model (continued)

Building a Vision Model Guidelines

Both vision models that your group builds should show the following:

- all the structures involved with animal vision
- whether the light receptors in the eye are high-sensitivity or low-sensitivity
- an object that the eye is looking at
- what the animal sees in bright light and in low light

The vision models will help you explain your ideas about the following:

- how the light receptors respond in bright light and in low light
- how information about an object is sent to the brain
- what happens when the brain processes information and recognizes the object
- why different animals need different amounts of light to see well

Materials for Building a Vision Model:

- 20 yellow pom-poms
- 20 hook-and-loop dots
- 1 hook-and-loop strip
- 2 pipe cleaners
- 2 feet of yarn
- 1 set of Thought Bubble cards
- 4 sheets of construction paper
- 1 ball
- markers
- masking tape
- plastic self-sealing bag

Name: _____ Date: _____

Planning Our Vision Model

1. With your group, record in the box below which structure will be repesented by which material in the model. (Some have been completed for you.)
2. With your partner, plan your Vision Model and answer the questions on the next page.

The Structures Our Materials Represent:

Eye: Box

Light: 20 yellow pom-poms

High-sensitivity light receptors: _____

Low-sensitivity light receptors: _____

Pupil: _____

Optic nerve: _____

Brain: _____

Name: _____ Date: _____

Planning Our Vision Model (continued)

Which model will you be building with your partner? (Circle one.)

eye with high-sensitivity receptors eye with low-sensitivity receptors

Draw your Vision Model plan in the box below. Make sure to clearly label all your materials. Also label how each structure in your eye will function. Think about the role that structure plays in allowing an animal to see and know what it is looking at.

Name: _____ Date: _____

Daily Written Reflection

Today you will build your Vision Model. How are models helpful for scientists?

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Seeing with Different Light Receptors

1. Think about an animal whose eyes have the same type of light receptors as the eye you and your partner will be building a model of in this lesson.
2. Imagine that this animal is looking out at a field that has a tree, a squirrel, and a bush.
3. Circle the image of the field this animal would see in low light and the image that this animal would see in bright light.

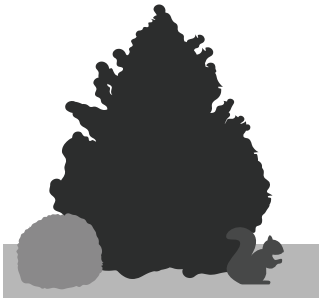
The type of light receptors in our Vision Model are (circle one): high-sensitivity low-sensitivity

Low light

Bright light

Low light

Bright light



Name: _____ Date: _____

Daily Written Reflection

What is the most interesting thing you have learned about animal vision? Why is that so interesting?

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Learning About a Vision Model

1. After you listen to another pair explain their Vision Model, answer the questions below.

What is one way this Vision Model is different from your Vision Model?

_____

_____

_____

What is one way this Vision Model is the same as your Vision Model?

_____

_____

_____

Name: _____ Date: _____

Chapter 4: Check Your Understanding

This is a chance for you to reflect on your learning so far. This is not a test. Be open and truthful when you respond.

Scientists investigate in order to explain how or why something happens. Am I getting closer to figuring out how a Tokay gecko uses its vision and other senses to survive in its environment?

I understand how a gecko uses its senses every day to survive. ____ Yes ____ Not yet

I understand how light allows a gecko to see. ____ Yes ____ Not yet

I understand how light travels from a source to a gecko's eyes. ____ Yes ____ Not yet

I understand what structures are involved in a gecko seeing its prey. ____ Yes ____ Not yet

I understand why the amount of light is important for a gecko to see well. ____ Yes ____ Not yet

I understand that science investigations use a variety of methods, tools, and techniques. ____ Yes ____ Not yet

I think I understand or don't yet understand these ideas because

_____

_____

What are you still wondering about how a gecko sees?

_____

_____

Name: _____ Date: _____

Daily Written Reflection

So far in this unit, you have discovered how the sense of vision works in different animals. What questions do you have about how the senses of smell, touch, hearing, or taste work? List them below.

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Changing Variables in *Investigating Animal Senses*

1. Read pages 8–9 and 16–18 in *Investigating Animal Senses*.
2. Discuss and answer the questions below.

Getting Ready to Investigate (pages 8–9)

Why is it important to choose your investigation materials carefully?

_____

_____

_____

Investigating the Guinea Pig (pages 16–18)

What were the students trying to find out?

_____

_____

_____

What did the students find out from the smell test?

_____

_____

_____

Why were the students unsure about what they learned from the vision test?

_____

_____

_____

Name: _____ Date: _____

Daily Written Reflection

You designed an investigation for one of your senses—hearing, smell, or touch. Which of the remaining two senses might you want to investigate? How could you investigate it at home?

_____

_____

_____

_____

_____

_____

Make a drawing if it helps you explain your thinking. Label your drawing.

Name: _____ Date: _____

Comparing Investigation Results

1. Record notes about the results of other groups' investigations.

Sense (circle one):	**What variable did the group change?**	**What were the group's results?**
Hearing Smell Touch		
Hearing Smell Touch		
Hearing Smell Touch		
Hearing Smell Touch		
Hearing Smell Touch		

Name: _____ Date: _____

Comparing Investigation Results (continued)

Sense (circle one):	What variable did the group change?	What were the group's results?
Hearing Smell Touch		
Hearing Smell Touch		
Hearing Smell Touch		
Hearing Smell Touch		
Hearing Smell Touch		

Name: _____ Date: _____

Chapter 5: Check Your Understanding

This is a chance for you to reflect on your learning so far. This is not a test. Be open and truthful when you respond.

Scientists investigate in order to explain how or why something happens. Am I getting closer to figuring out how animals use their vision and other senses to survive in their environment?

I understand how animals use their senses every day to survive. ____ Yes ____ Not yet

I understand that animals have different structures that sense different types of information in their environment. ____ Yes ____ Not yet

I understand why different animals respond to different amounts of information from their environment. ____ Yes ____ Not yet

I understand that science investigations use a variety of methods, tools, and techniques. ____ Yes ____ Not yet

I think I understand or don't yet understand these ideas because

_____

_____

What are you still wondering about animals' senses?

_____

_____

Glossary

environment: all the living and nonliving things in an area
ambiente: todo (viviente y no viviente) lo que hay en un área

explanation: a description of how something works or why something happens
explicación: una descripción de cómo algo funciona o por qué algo pasa

evidence: information that supports an answer to a question
evidencia: información que respalda una respuesta a una pregunta

function: what something can do
función: lo que algo puede hacer

investigation: an attempt to find out about something
investigación: un intento de aprender sobre algo

model: something scientists make to answer questions about the real world
modelo: algo que los científicos crean para responder preguntas sobre el mundo real

observe: to use any of the five senses to gather information about something
observar: usar cualquiera de los cinco sentidos para recolectar información acerca de algo

predator: an animal that hunts and eats other animals
depredador: un animal que caza y come otros animales

prey: an animal that is hunted and eaten by other animals
presa: un animal que es cazado y comido por otros animales

process: to change information from one form to another
procesar: cambiar información de una forma a otra

receptor: a structure that responds to information coming in from the environment
receptor: una estructura que responde a información que viene del ambiente

reflect: to cause light to bounce off a material
reflejar: hacer que la luz rebote contra un material

sense: (noun) how an animal gets information from its environment
sentido: cómo un animal obtiene información de su ambiente

sense: (verb) to get information from the environment
sentir: obtener información del ambiente

sensitive: responding to small amounts of information
sensible: que responde a pequeñas cantidades de información

sensitivity: how strongly something responds to information
sensibilidad: con qué fuerza responde algo a la información

structure: the way something is shaped or what it is made out of that makes it good for a specific function
estructura: la forma que tiene una cosa, o de qué está hecha esa cosa, que la hace adecuada para una función específica

survive: to stay alive
sobrevivir: mantenerse vivo

variable: something that can change in an investigation
variable: algo que puede cambiar en una investigación

vision: the ability to see
visión: la capacidad de ver

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Your Investigation Notebook

Scientists use notebooks to keep track of their investigations. They record things they learn from other scientists. Sometimes they draw or make diagrams. They record ideas and information they want to remember.

Your Investigation Notebook is a place for you to keep track of:

- investigations you do in class.
- what you learn from reading science books.
- your questions, predictions, and observations.
- your explanations and the evidence you find to support those explanations.
- your ideas!

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