Appendix B

Module Storyline

Anchor Phenomenon: Elephants Sensing Distant Rainstorms

Essential Question: How do elephants sense rainstorms from more than 100 miles away?

Conceptual Overview

Animals have sensory structures with receptors specialized to receive information, process the information in their brain, and respond to the information in different ways.

1. Sensory structures in animals have receptors specialized to receive particular types of information about their environments.
2. Waves are regular patterns of motion that transfer energy across a distance without the net transfer of matter. Animals' touch and sound receptors detect vibrations from waves.
3. Animals' brains receive and process information that can guide their actions.

NGSS Performance Expectations

4-LS1 From Molecules to Organisms: Structures and Processes

4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

4-LS1-2 Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

4-PS4 Waves and Their Applications in Technologies for Information Transfer

4-PS4-1 Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

Concept 1: Sensory Structures (Lessons 1–6)

Focus Question: How do animals receive information about their environments?

Lessons 1–3

Phenomenon Question: What do elephants sense about their environment?

Phenomenon: Elephants Sensing Distant Rainstorms

Spotlight on Three-Dimensional Integration: Students read an article about how elephants can sense distant rainstorms (LS1.A, LS1.D)—the module anchor phenomenon—and recognize patterns (CC.1) in their observations about elephant senses. Then students generate questions (SEP.1) about the phenomenon to build a driving question board.

Knowledge Statement: Elephants use their senses to receive information about their environment.

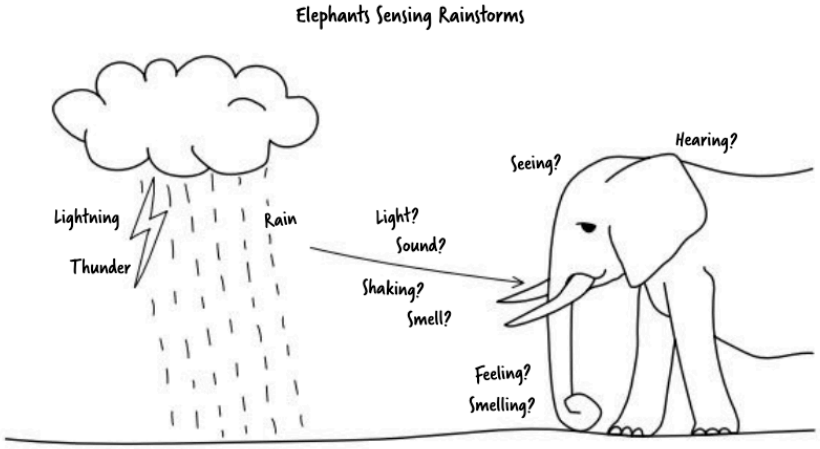
Wonder:* We close our eyes and use our senses to make observations about the environment around us. As we share our observations, we group them into categories for our five senses. Our teacher shows us a photograph of elephants at a waterhole in the Namibian savanna and asks us to describe what we would observe if we were the elephants in the photo. After sharing our observations, we agree that we use our senses to get information about our environment.

To help us understand what types of information elephants sense, our teacher provides the anchor phenomenon: a story about how elephants living in hot, dry environments can detect rainstorms from more than 100 miles away. We reflect on the reading by filling out a notice and wonder chart.

Organize: As a class, we discuss ways that we know a rainstorm is coming. We use our ideas to develop an initial model in our Science Logbooks to help us explain how elephants might be sensing distant rainstorms.

We compare our models and notice similarities. We use these similarities to start an anchor model explaining how we think elephants sense distant rainstorms.

- *Information can be sensed about rainstorms, but we are unsure which types of information.*
- *Information travels from the rainstorm to the elephant, but we are unsure how.*
- *Elephants use their senses to detect a rainstorm, but we are unsure which senses they use.*

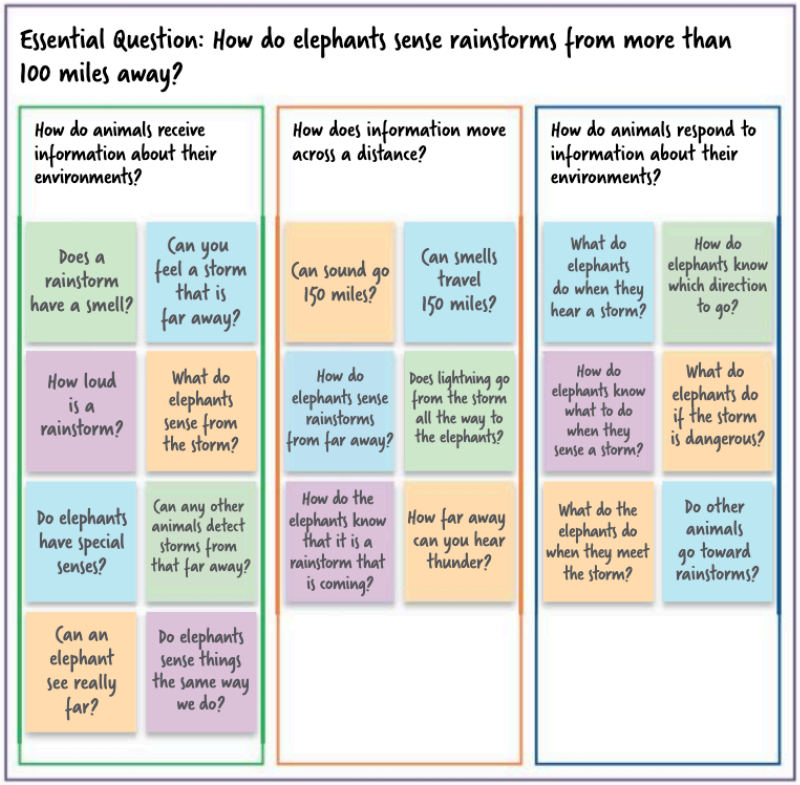


Elephants can sense rainstorms from more than 100 miles away, but we're not sure how. Do the elephants see, hear, smell, or feel the storms?

* The purple headings indicate the relevant content stage within the content learning cycle. See the Implementation Guide for more information on the content learning cycle.

We generate questions from our models and use the questions to create a driving question board. We plan to answer these questions: How do animals receive information about their environments? How does information move across a distance? How do animals respond to information about their environments?

Our teacher synthesizes these questions into an Essential Question about the anchor phenomenon: **How do elephants sense rainstorms from more than 100 miles away?**



Next Steps: Through class discussion, we determine the best place to start answering the Essential Question is with the question How do animals receive information about their environments?

Lessons 4–5

Phenomenon Question: How do animals sense information differently than humans do?

Phenomenon: Animal Senses

Spotlight on Three-Dimensional Integration: Students gather information from each station to explain (SEP.8) how sensory structures and receptors (CC.6) help animals sense information about their environments (LS1.A, LS1.D).

Knowledge Statement: The sensory structures in animals have receptors specialized to receive particular types of information about their environments.

Reveal: We visit six Sense Stations to learn how animals sense information differently than humans do. We learn that sensory structures have receptors that are specialized to receive certain types of information, such as light and sound.

We work with a group to develop a model that shows how a sensory structure receives information about the environment. Then we share our models with our classmates and give each other feedback.

Distill: We summarize what we know about sensory structures by creating an anchor chart.

Sense and Response

Sensory Structures

- Animals have sensory structures (e.g., eyes, ears, nose) that help them gather information about their environments.
- These sensory structures contain smaller substructures called sensory receptors. Different sensory receptors receive different information (light, sound, taste, touch, odor) about the same environment and send it to the animal's brain.

Know: In a Conceptual Checkpoint, we apply our understanding of senses in animals from the Sense Stations to another animal.

We use our new knowledge from the Sense Stations to start answering the questions on the driving question board and come up with the next question we want to answer.

Next Steps: We want to know how elephants sense information that humans cannot.

Lesson 6

Phenomenon Question: What sensory structures do elephants have to sense information?

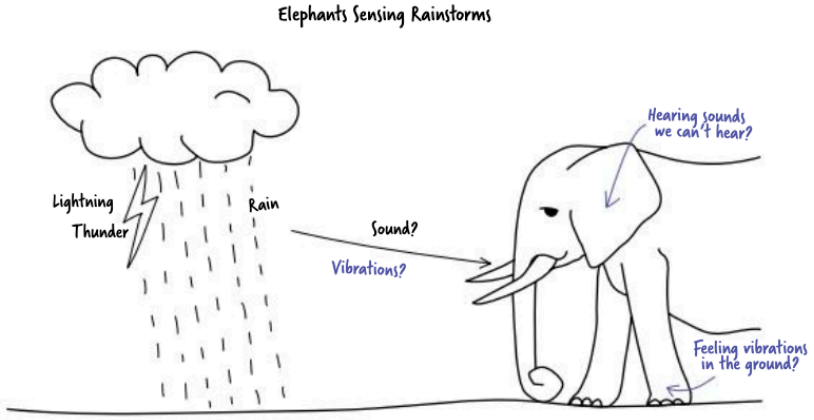
Phenomenon: Elephant Senses

Spotlight on Three-Dimensional Integration: Students use the information in *The Elephant Scientist* (O'Connell and Jackson 2011) (SEP.8) to develop questions about the sensory structures (CC.6) that elephants have to help them sense information about their environment (LS1.A, LS1.D).

Knowledge Statement: Elephants' sensory structures allow them to sense information from distant rainstorms that humans cannot.

Organize: We revisit the picture of the elephants at a watering hole in Namibia, and our teacher asks us to make predictions to answer the question What information can elephants sense differently than humans do?

Reveal: We read pages 1–3 from *The Elephant Scientist* by Caitlin O'Connell and Donna M. Jackson (2011). After reading, we reflect on our anchor model to determine which senses elephants might use to detect rainstorms from more than 100 miles away. In the text, we notice information about sensory structures: elephants might hear sounds from the rainstorms that humans cannot hear, or they might feel them with their feet. We use this information to update our anchor model.



We think there is something special about an elephant's ears and feet that help it hear sounds and feel vibrations in the ground that humans cannot sense. Maybe these sensory structures have receptors that are specialized to sense rainstorms from more than 100 miles away.

Our teacher revisits *The Elephant Scientist*. We discuss the authors' description of vibrations. The description says that when vibrations move across Earth's surface, they "ripple across surfaces like waves on water." This makes us curious about how something such as the ground might ripple like water, so we share ideas for how we might investigate in the classroom.

Next Steps: We decide to explore the question How can ripples in water help explain vibrations on land?

Concept 2: Sensing Waves (Lessons 7–14)

Focus Question: How does information move across a distance?

Lessons 7–9

Phenomenon Question: What makes water waves appear the way they do?

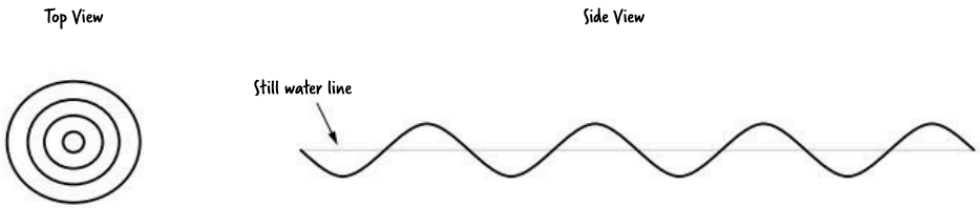
Phenomenon: Waves

Spotlight on Three-Dimensional Integration: Students observe the patterns (CC.1) of water waves caused by a disturbance in a system (CC.4) to develop a model (SEP.2) that can be used to describe waves in terms of amplitude and wavelength (PS4.A).

Knowledge Statement: A wave is a regular pattern of motion caused by a disturbance in a system.

Wonder: Our teacher asks us to sit on the floor in a circle and place both our hands on the ground. Our teacher stands in the middle of the circle and stomps. We notice that we feel the floor vibrate. Our teacher stomps again and asks us to raise our hands when we feel the vibration. We notice that we all raise our hands, and we agree that the vibrations travel outward in all directions. We notice that the vibrations form a pattern similar to ripples in water.

Organize: We wonder how ripples in water can help explain vibrations on land, so we explore this further by making ripples in cups of water. As we observe the ripples in the cups, we draw a diagram of what we see. We discuss our models with the class and notice that our models only show the ripple from the top. We decide to think about what the ripple may look like if we cut it in half, and we include a drawing of what we think the side view of a wave looks like.



Our teacher asks us how we could use water waves as a model to better understand vibrations on land. We decide that we need to make water waves in the classroom.

Reveal: When we start making waves in a tank, we notice that not all waves are the same. Our teacher asks us to complete a cause and effect chart to record what we discover as we use the wave tanks, and we notice some similarities.

Distill: We decide we need to describe what a wave is by developing a model. We notice that as we discuss the model, we need to use more precise words to describe the waves we noticed. We decide to update the anchor chart to capture this knowledge.

Sense and Response

Sensory Structures

- Animals have sensory structures (e.g., eyes, ears, nose) that help them gather information about their environments.
- These sensory structures contain smaller substructures called sensory receptors. Different sensory receptors receive different information (light, sound, taste, touch, odor) about the same environment and send it to the animal's brain.

Waves

- Waves form regular patterns described by their wavelength and amplitude.

Next Steps: We decide to think more about the relationship between energy and waves to help us better understand vibrations on land.

Lessons 10–11

Phenomenon Question: How can ripples in water help explain vibrations on land?

Phenomenon: Waves and Vibrations

Spotlight on Three-Dimensional Integration: Students confirm that waves transfer energy from one place to another (CC.5) and that this energy can cause objects in the path of the wave to move up and down or back and forth (PS4.A). Students combine information (SEP.8) about vibrations and sensory receptors from *The Elephant Scientist* with their new understanding of waves to revise their anchor model.

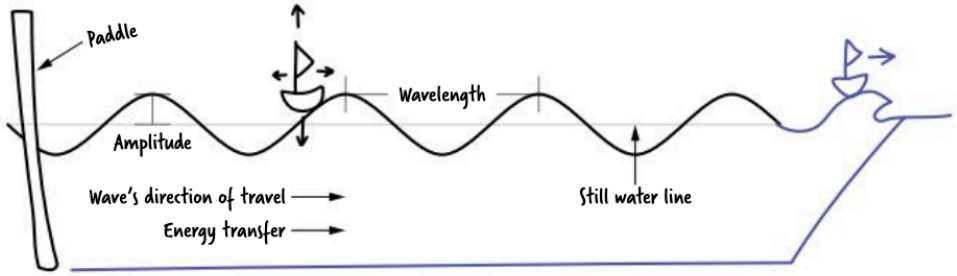
Knowledge Statement: A wave transfers energy across a distance, causing vibrations in matter that can be detected.

Organize: In Lesson 8, we saw a video of a buoy moving up and down as waves pass. We remember learning about energy and motion in Module 2, and we learned that motion is an indicator of energy. But we want to know more about the relationship between energy and waves. We decide to investigate this by placing an object in the wave tank. We think the waves will push the object to the other side of the tank.

Reveal: Our teacher puts a boat in the wave tank, asks us to watch the boat closely, and then creates waves. We observe that the boat did not move across the tank; it only moved up and down and side to side a little. We add this new learning to our class wave model from Lesson 9.

We wonder why we see waves pushing surfers and seaweed to shore when we go to the beach. Our teacher adds a metal paint tray to the bottom of the wave tank to act as a sloped beach. We observe the effect of the waves on the boat when it is far from the beach and when it is close to the beach. When the boat is near the beach, the boat moves in the same direction as the wave.

Distill: We add this new learning to our individual models. We then update the class wave model and the anchor chart.



A wave is a regular pattern of motion caused by a disturbance. The paddle causes a disturbance, and the wave travels away from it. The amplitude is the height of the wave. The wavelength is the distance from one wave peak to the next. In deep water, waves transfer energy, but they do not transfer matter. This explains why an object moves up and down or side to side when waves pass but stays in about the same spot. The slanted ocean floor by the beach causes matter to move in the direction of the wave.

Sense and Response
Sensory Structures • Animals have sensory structures (e.g., eyes, ears, nose) that help them gather information about their environments. • These sensory structures contain smaller substructures called sensory receptors. Different sensory receptors receive different information (light, sound, taste, touch, odor) about the same environment and send it to the animal's brain.
Waves • Waves form regular patterns described by their wavelength and amplitude. • Waves moving across deep water move matter up and down or back and forth but do not cause matter to move in the same direction as the wave. • Waves transfer energy across a distance.

Organize: We think back to the vibrations we felt on the floor when our teacher stomped and conclude that vibrations are the motion we detect when energy moves through matter. We recall that elephants may sense rainstorms by feeling vibrations from the storm, but we decide we still need to know about how elephants sense those vibrations.

Reveal: We think elephants are using their touch sensory receptors to sense a rainstorm and agree to investigate further by reading the chapter "Fancy Footwork" on pages 29–33 in *The Elephant Scientist*. From the reading, we learn that elephants have special receptors in their feet that help them detect vibrations.

Distill: We conclude that for an animal to sense vibrations in the ground, energy must travel from a source to the animal's touch receptors. We add this new knowledge to the anchor chart and update our anchor model.

Sense and Response
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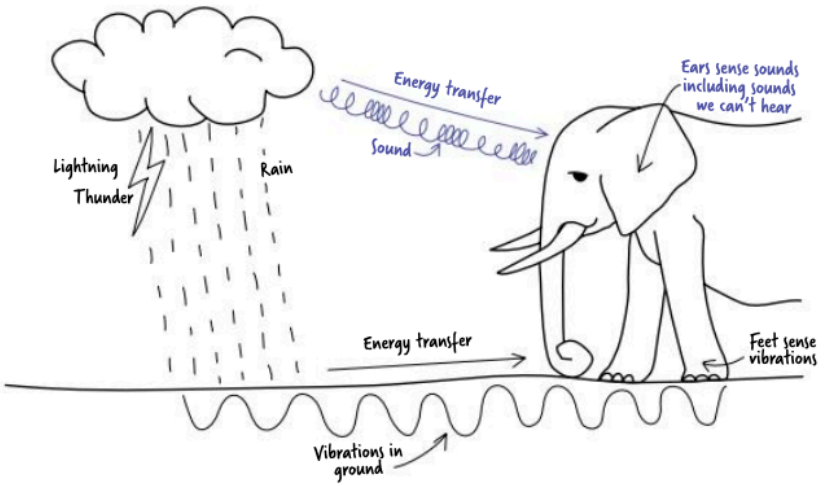
Elephants Sensing Rainstorms



Energy is transferred from a rainstorm through the ground by waves. As energy moves through the ground, it causes vibrations that we think elephants can sense with their feet. Maybe these sensory structures have receptors that are specialized to sense rainstorms from more than 100 miles away.

Next Steps: From the book, we find that elephants may also sense sounds in the air. We decide to investigate how sound works next.

Lessons 12–14

Phenomenon Question: How does sound work?

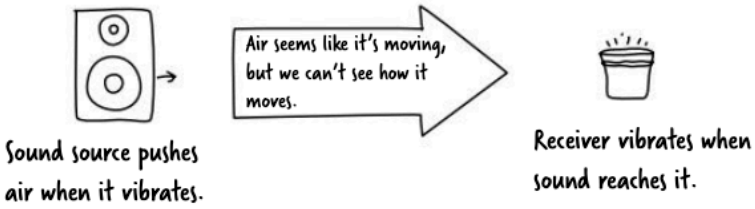
Phenomenon: Sound

Spotlight on Three-Dimensional Integration: Students investigate how sound is produced, how it travels, and how it is detected. They use a spring to model how sound travels through the air. Students develop a model (SEP.2) to explain the cause and effect relationships (CC.2) behind the movement of waves (PS4.A) and how energy can be transferred (CC.5) by sound.

Knowledge Statement: A sound is a vibration in matter that an animal can hear when the vibration reaches an animal's ears.

Organize: We think about how sound might work, and our teacher shows us some materials we will use to explore how sound is produced, how it travels, and how it is detected.

Reveal: We work in small groups to explore sound. As we investigate, we notice that sounds cause vibrations, and we feel air moving near a speaker that is playing music. We decide to create a class sound model to explain what we observe.

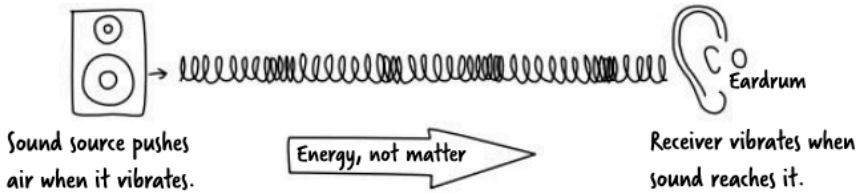


After modeling sound, we decide we need to look more closely at our ears to figure out if our ears vibrate in response to sound. We look at a diagram of the inside of an ear and notice a structure that looks like a drum. Our teacher explains that this internal structure is called an eardrum. We use this information to update our class sound model.

We realize that we still need to explore how sound travels from the source, through the air, and to sensory structures. We decide that we need a way to represent air. Our teacher shows us a precompressed spring toy we can use to model air. We remember from our sound investigation that the speaker pushed in and out as sound came out, so we decide to plan and carry out an investigation where we push the spring back and forth to represent the motion of air when sound moves from place to place.

We mark spots on the spring to help us track the movement of matter when we compress the spring. We notice that energy moves all the way to the other side of the spring, but matter doesn't move from one side of the spring to the other because the marked spots on the spring only move back and forth in about the same place.

Distill: We decide to update our anchor chart and class sound model with this new learning.



Sense and Response

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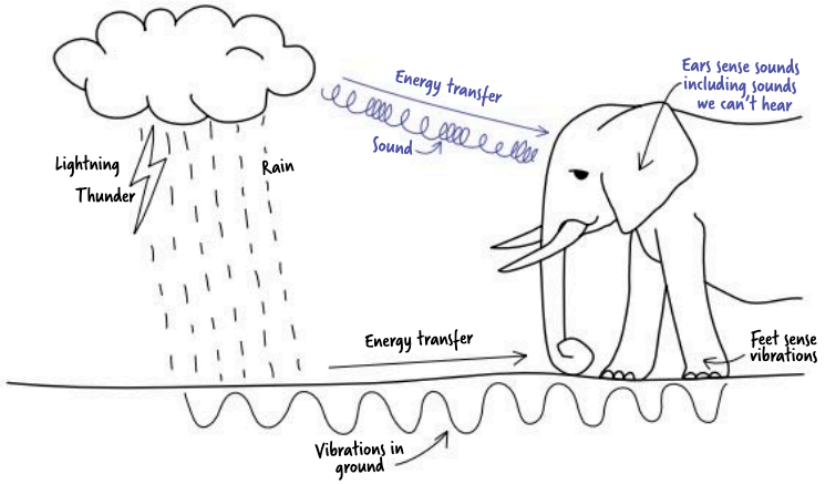
- Sound travels through the air like a spring, moving the air back and forth but not over a significant distance.

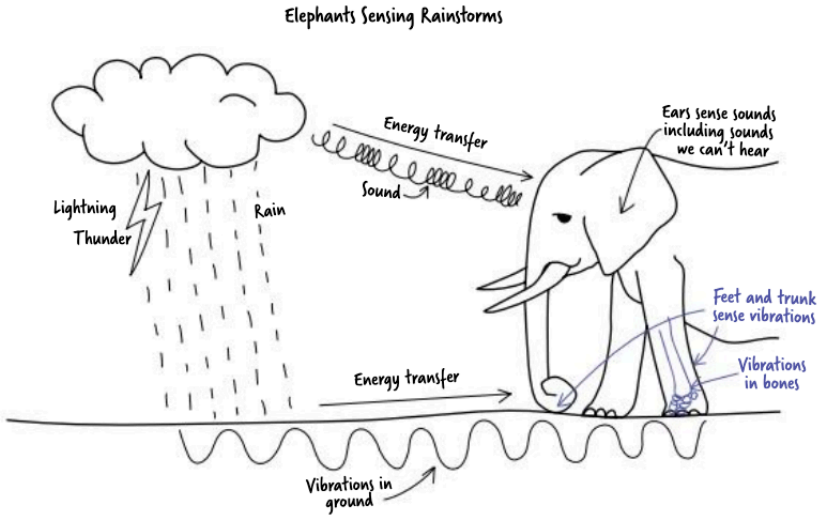
Our teacher shows a video to explore how elephants sense sound from a rainstorm. The scientist in the video explains that really low sounds come from a rainstorm that humans cannot hear but elephants can hear. We add this new information to the anchor model.

Elephants Sensing Rainstorms



Energy is transferred from a rainstorm through the ground by waves and air. As energy moves through the ground, it causes vibrations that we think elephants can sense with their feet. When energy moves through the air as sound, it causes the elephants' eardrums to vibrate. Maybe these sensory structures have receptors that are specialized to sense rainstorms from more than 100 miles away.

	Know: In a Conceptual Checkpoint, we explain how people with different sensory abilities might interpret a symphony by applying our understanding of waves, sound, and energy. *Next Steps:* Our teacher asks whether we are ready to apply our knowledge and think like scientist Dr. O'Connell did during her research in Namibia.
Application of Concepts (Lessons 15–19): Science Challenge *Phenomenon Question: Can elephants interpret information from the vibrations they feel?*	
Lessons 15–19 (Science Challenge)	
Phenomenon Question: Can elephants interpret information from the vibrations they feel? **Phenomenon:** Science Challenge **Spotlight on Three-Dimensional Integration:** Students plan and carry out an investigation (SEP.3) to explore whether elephants can interpret information that is transferred through ground vibrations alone (CC.5). Students then return to *The Elephant Scientist* to learn more about the system (CC.4) of sensory structures that allows elephants to detect distant rainstorms (LS1.D). **Knowledge Statement:** An elephant's sensory structures and receptors form a system that allows the elephant to detect and interpret information from ground vibrations.	**Wonder:** To introduce the Science Challenge, our teacher reads "School Days" on pages 34 and 35 in *The Elephant Scientist.* We wonder, like Dr. O'Connell, whether elephants are only hearing sound or can also sense and interpret vibrations in the ground. We begin by thinking about what we have learned so far: ▪ *Elephants can hear sounds, including some that humans cannot, from across a distance.* ▪ *Elephants have sensory receptors in their feet that are specialized to detect ground vibrations across a distance.* ▪ *Elephants can generate both infrasound and ground vibrations.* We wonder whether elephants can get information from the vibrations they feel, so we decide to plan and carry out an investigation in the classroom to explore this question. **Organize and Reveal:** With our teacher's help, we plan investigations in groups and share our plans with our teacher for feedback. We make improvements based on feedback and carry out the investigation. After we carry out our investigation, we notice that we still need to make more improvements to ensure a fair test, and we carry out the investigation again. Like scientists, we use our results to answer the question Can elephants interpret information from the vibrations they feel? **Distill:** To reflect on our experience, we read "Ears to the Ground" (pages 42–44) from *The Elephant Scientist* and compare our investigation with the one Dr. O'Connell and her team conducted. We read "Caller IDs" (pages 49–51) to obtain more information about structures in elephants' feet and trunk that are specialized to detect ground vibrations. We add these new elements to our anchor model.



Energy is transferred from a rainstorm through the ground by waves and air. As energy moves through the ground, it causes vibrations that we think elephants can sense with their feet and trunks. When energy moves through the air as sound, it causes the elephants' eardrums to vibrate. Moving energy also causes vibrations as it travels from the elephants' toes up through their bones and to the sound receptors in their ears. This allows elephants to hear ground vibrations.

Next Steps: We wonder if elephants can detect different vibrations because of their ability to use their brains to think about things—and maybe to detect a distant rainstorm.

Concept 3: Response (Lessons 20–25)

Focus Question: How do animals respond to information about their environments?

Lesson 20

Phenomenon Question: Why do animals respond to information about their environments?

Phenomenon: Animal Responses

Spotlight on Three-Dimensional Integration: Students identify possible causes for animal responses and the resulting effects on behavior (CC.2). Students then obtain and combine information (SEP.8) from photographs depicting a variety of animal behaviors to identify patterns (CC.1) that support the idea that animals may respond to information in different ways for the purposes of survival, growth, and reproduction (LS1.A, LS1.D).

Knowledge Statement: Animals receive information about their environments and respond in ways that help them survive, grow, and reproduce.

Wonder and Organize: Our teacher unexpectedly tosses a piece of crumpled paper toward us, and many of us shriek, laugh, or duck. We discuss why we responded the way we did and how our senses help us respond in different situations.

Reveal: We work in groups to explore how animals respond to information they sense about their environments. Each group receives a photo of an animal and answers the following questions:

- What is the animal's behavior? (effect)
- What might the animal be responding to? (cause)
- What is the purpose of this behavior?

Our teacher gives our groups a set of all the pictures, and we categorize them according to the purpose of each response. Some of our categories are find food, stay safe, and make babies.

Distill: We discuss the similarities and differences between the categories we listed, and we decide there are three main purposes for animal behavior: survival, growth, and reproduction. We record our new learning on the anchor chart.

Sense and Response

Sensory Structures

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Waves

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Response

- Animals receive information from their senses and then respond in ways that help them survive, grow, and reproduce.

Next Steps: We still want to know how animals know what to do with the information they sense.

Lessons 21–23

Phenomenon Question: How do animals process and respond to information about their environments?

Phenomenon: Information Processing in Animals

Spotlight on Three-Dimensional Integration: Students analyze videos of animal behavior to gather evidence to make a claim (SEP.7) about whether an animal exhibits innate or learned behavior. Then students read about animal senses to obtain and combine information (SEP.8) about the system (CC.4) that allows animals to sense, process, and respond to information about their environments (LS1.D).

Knowledge Statement: Animals receive information about their environments, process the information by using internal structures, and respond with either innate or learned behaviors.

Organize: We begin by sharing examples of how human babies respond to information that helps them grow and survive. Our teacher asks us to look at examples we gave to determine whether babies "just knew" how to do this or must learn through practice.

Reveal: To explore how humans respond to information, we work with a partner and toss a table tennis ball toward a piece of acrylic glass in front of our partner's face. We notice that our responses to the table tennis ball happened automatically. Our teacher refers to this behavior as innate behavior. Our teacher tells us to draw a picture of a dog in our Science Logbook. Our teacher then asks us how we knew what to draw. We all notice that drawing a dog requires us to use our experiences and memories. Our teacher calls this a learned behavior. Our teacher reads a story, and we record the sequence of events that allows animals to respond to information. Through discussion about the reading, we agree on the following information processing steps:

1. Information is transferred through the environment to the animal.
2. Animal receives the information through external sensory structures.
3. Animal processes the information by using internal structures.
4. Animal responds to the information.

We organize our thinking about how animals receive, process, and respond to information about their environments and apply what we know about innate and learned behavior to analyze information processing in animals.

Our teacher tells us we will work as behavioral biologists to analyze animal behavior. We complete a field note entry by describing how the animal senses and responds to information and inferring the purpose of its behavior.

Distill: We update our anchor chart with the big ideas we learned about how animals process information in their environments.

Sense and Response

Sensory Structures

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Response

- Animals receive information about the environment through their external sensory structures and process the information using internal structures. They then respond in ways that help them survive, grow, and reproduce.
- Animal behaviors can be innate or learned.

Know: In a Conceptual Checkpoint, we apply our understanding of information processing to explain how an aquatic organism senses, processes, and responds to information in its environment.

Next Steps: We want to explore how elephants process information and respond to their environment.

Lessons 24–25

Phenomenon Question: How do elephants process and respond to information about their environment?

Phenomenon: Elephant Memory and Communication

Spotlight on Three-Dimensional Integration: Students use patterns (CC.1) in elephant behavior as evidence to construct explanations (SEP.6) about how elephants process and respond to information about their environment (LS1.D).

Knowledge Statement: Animals use prior experiences and memories to process, respond to, and communicate information about their environments.

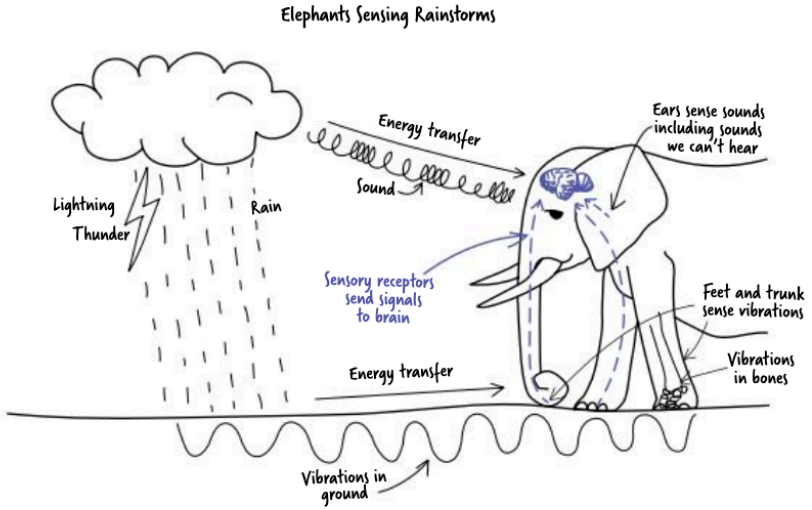
Organize: We start by filling in a four-square chart in our Science Logbooks with what we already know about how elephants process information about their environment. We realize that we still need to know how elephants process and respond to information.

Reveal: We break into groups and research different topics in *The Elephant Scientist*. As we read, we record evidence of elephants' information processing.

We notice a pattern as we research: many examples exist of how well elephants remember things. We also notice another pattern: elephants demonstrate many examples of communication. We apply what we know to complete the rest of the four-square chart.

Distill: We work in groups to list the important ideas we learned about elephants sensing rainstorms and develop a key concepts checklist for our anchor model. The key concepts checklist includes different types of information (sound, ground vibrations), sensory structures, processing information, and responses.

We then revise our initial models, and with a partner, we compare our models. Through class discussion, we agree how elephants might sense distant rainstorms, and we make the last update to our anchor model.



Energy is transferred from a rainstorm through the ground by waves and air. As energy moves through the ground, it causes vibrations that we think elephants can sense with their feet and trunks. When energy moves through the air as sound, it causes the elephants' eardrums to vibrate. Moving energy also causes vibrations as it travels from the elephants' toes up through their bones and to the sound receptors in their ears. This allows elephants to hear ground vibrations. Elephants then process the information and respond by moving toward the storm so they can get water to survive.

We individually think about and reflect on our understanding related to the Essential Question: How do elephants sense rainstorms from more than 100 miles away? We realize we still have not answered all our questions on the driving question board. Our teacher explains that in science, sometimes more questions are asked than answered, and we will need to conduct more research.

Next Steps: We wonder whether we could apply our new learning to plants.

Extension of Concepts (Lessons 26–28): Research Project

Phenomenon Question: How do plants respond to their environment?

Lessons 26–28 (Research Project)

Phenomenon Question: How do plants respond to their environment?

Phenomenon: Research Project

Spotlight on Three-Dimensional Integration: Students work with peers to obtain and combine information (SEP.8) that explains how plant structures support survival, growth, and reproduction (LS1.A). After gathering the necessary information to describe how the components in these systems interact (CC.4), students engage in argument from evidence (SEP.7) to evaluate their claims.

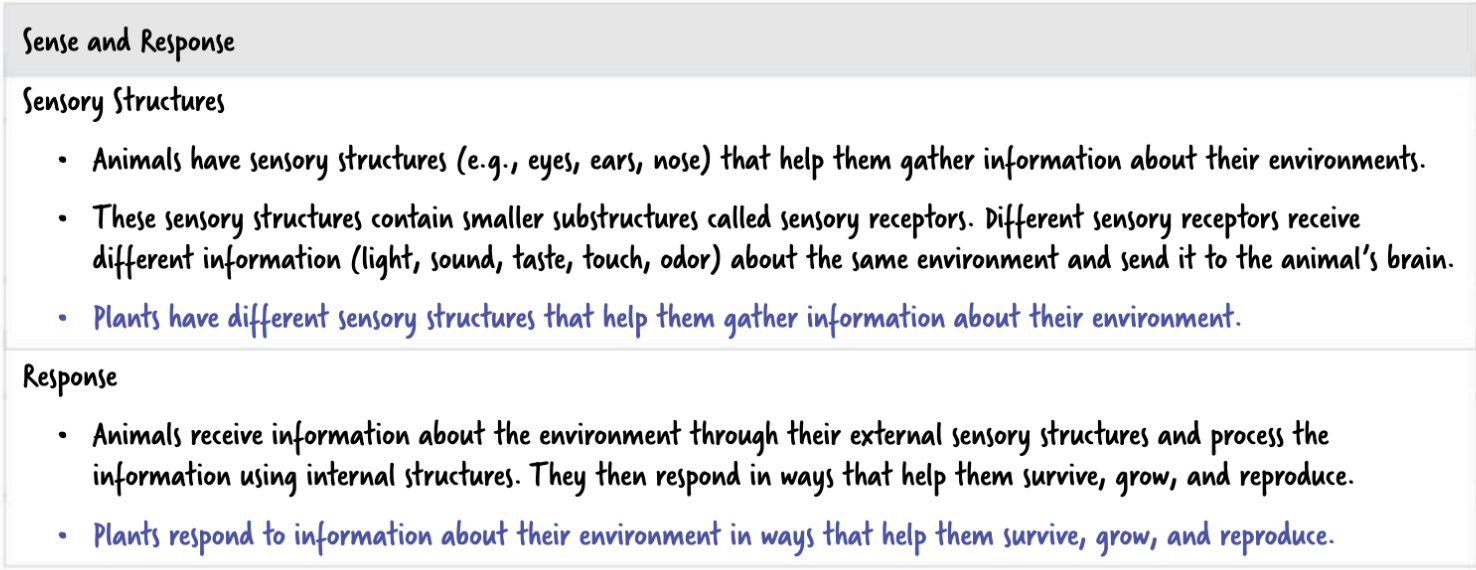
Knowledge Statement: Plants have internal and external structures that enable them to respond to their environment in ways that promote survival, growth, and reproduction.

Wonder and Organize: We use the anchor chart to consider how our learning might apply to plants. We develop claims describing how plants sense and respond to information in their environment. Some examples include the following:

- *I think that plants can hear because I have heard that plants can respond to music.*
- *I do not think that plants can hear because they don't have ears or brains.*

Reveal: We form research groups based on the senses we wrote a claim about and brainstorm how we could gather evidence to evaluate our claims. Our teacher shares resources and coaches us to find evidence from books and websites. We think about other ways to obtain evidence to support our claims and decide we could plan an investigation. We work with our groups to plan an investigation and present our claims and evidence to our classmates.

Distill and Know: To end the module, we reflect on the similarities and differences in how plants and animals interact with their environments. We update our anchor chart to include what we have learned about how plants sense and respond to information.



Application of Concepts (Lessons 29–31): Socratic Seminar, End-of-Module Assessment *Essential Question: How do elephants sense rainstorms from more than 100 miles away?*	
Lessons 29–31 (Socratic Seminar, End-of-Module Assessment, End-of-Module Assessment Debrief)	
Essential Question: How do elephants sense rainstorms from more than 100 miles away? **Phenomenon:** Sensing Distant Rainstorms **Spotlight on Three-Dimensional Integration:** To demonstrate understanding from the module, students apply their knowledge of structure and function (CC.6) to construct explanations (SEP.6) of how animals sense information from their environments, including information that travels through wave-like vibrations and sound (LS1.A, LS1.D, PS4.A). **Knowledge Statement:** Animals have sensory structures with receptors specialized to receive information, process the information in their brain, and respond to the information in different ways.	**Distill:** As a class, we participate in a Socratic Seminar and discuss our Essential Question: How do elephants sense rainstorms from more than 100 miles away? We use the driving question board, the anchor chart, and the anchor model to help us form a claim to answer this question. **Know:** We show our understanding of senses and responses in the End-of-Module Assessment, and then we reflect on our learning and the assessment. *Next Steps:* To finish the module, we discuss any remaining questions about sensing and responding to information in the environment.

Appendix C

Module Glossary

These are Level 4–appropriate descriptions of the module terminology and are not intended to be complete definitions.

Term	Description	Lesson
Amplitude	the height of a wave, measured from the baseline (still water line) to the wave's peak	9
Function (life science)	the purpose of a structure to help an organism survive, grow, or reproduce	4
Information (life science)	details about an environment that an animal can sense	1
Information processing	a series of steps that allows sensed information to result in an appropriate response	22
Innate behavior	a behavior that occurs without having to learn it (e.g., instinct, reflex)	21
Instinct	a behavior—often complex—that an animal performs without being taught (e.g., hibernation)	21
Learned behavior	a behavior that requires experience and memory	21
Reflex	a simple, automatic response to something that happens	21
Response	a behavior that results from sensing information about an environment	20
Sense (n.)	a way organisms receive information about their environments (e.g., sense of smell)	1

Term	Description	Lesson
Sense (v.)	to detect information about an environment by using external structures containing receptors specialized to receive particular types of information	1
Sensory receptor	a substructure in the sensory structure that receives information about an environment and sends it to an animal's brain	5
Sensory structure	a structure that helps an organism gather information about its environment	4
Structure (life science)	a part of the animal's body that serves a specific purpose	4
Vibration	a type of motion that occurs when matter moves quickly back and forth or up and down in place	6
Wave	a regular pattern of motion that transfers energy across a distance	7
Wavelength	the distance from one wave peak to the next, measured from peak to peak	9