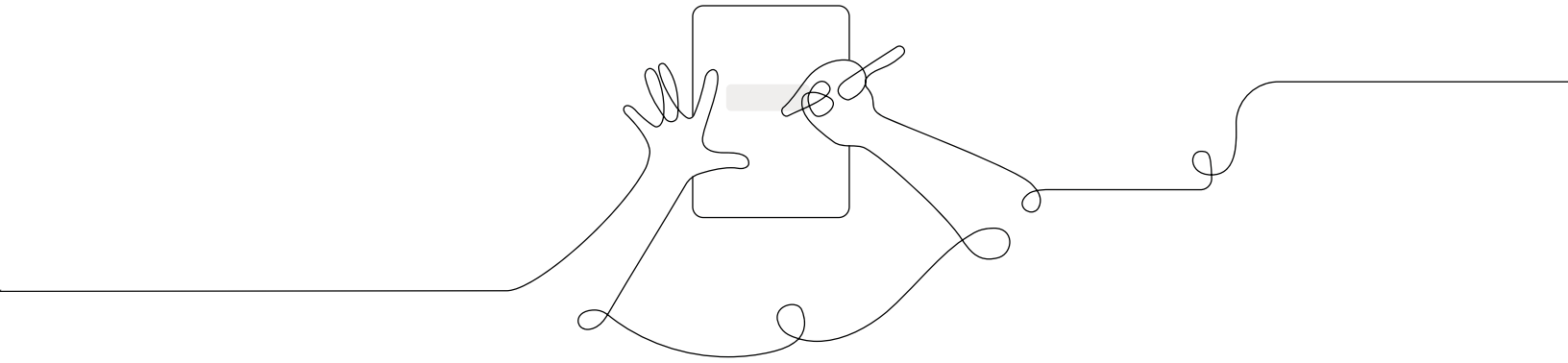
AmplifyScience

Participant Notebook

Grade 4, Vision and Light Guided Unit
Internalization with @Home Resources



Unit Guide resources

Once a unit is selected, select **JUMP DOWN TO UNIT GUIDE** in order to access all unit-level resources in an Amplify Science unit.

Planning for the unit

Unit Overview	Describes what's in each unit, the rationale, and how students learn across chapters
Unit Map	Provides an overview of what students figure out in each chapter, and how they figure it out
Progress Build	Explains the learning progression of ideas students figure out in the unit
Getting Ready to Teach	Provides tips for effectively preparing to teach and teaching the unit in your classroom
Materials and Preparation	Lists materials included in the unit's kit, items to be provided by the teacher, and briefly outlines preparation requirements for each lesson
Science Background	Adult-level primer on the science content students figure out in the unit
Standards at a Glance	Lists Next Generation Science Standards (NGSS) (Performance Expectations, Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts), Common Core State Standards for English Language Arts, and Common Core State Standards for Mathematics

Teacher references

Lesson Overview Compilation	Lesson Overview of each lesson in the unit, including lesson summary, activity purposes, and timing
Standards and Goals	Lists NGSS (Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts) and CCSS (English Language Arts and Mathematics) in the unit, explains how the standards are reached
3-D Statements	Describes 3-D learning across the unit, chapters, and in individual lessons
Assessment System	Describes components of the Amplify Science Assessment System, identifies each 3-D assessment opportunity in the unit
Embedded Formative Assessments	Includes full text of formative assessments in the unit
Books in This Unit	Summarizes each unit text and explains how the text supports instruction
Apps in This Unit	Outlines functionality of digital tools and how students use them (in grades 2-5)

Printable resources

Copymaster Compilation	Compilation of all copymasters for the teacher to print and copy throughout the unit
Investigation Notebook	Digital version of the Investigation Notebook, for copying and projecting
Multi-Language Glossary	Glossary of unit vocabulary in multiple languages
Print Materials (8.5" x 11")	Digital compilation of printed cards (i.e. vocabulary cards, student card sets) provided in the kit
Print Materials (11" x 17")	Digital compilation of printed Unit Question, Chapter Questions, and Key Concepts provided in the kit

Unit Map

Why is an increase in light affecting the health of Tokay geckos in a Philippine rain forest?

Working as conservation biologists, students figure out why a population of Tokay geckos has decreased since the installation of new highway lights in the rain forest. Students use their understanding of vision, light, and information processing to figure out why an increase in light in the geckos' habitat is affecting the population. Then students turn their attention to humans by designing their own investigations in order to learn more about how our senses help us survive.

Chapter 1: How does a Tokay gecko get information about its environment?

Students figure out: In order to survive, a gecko must avoid predators and find prey. To do this, geckos use structures to get information from their environment. For instance, a gecko uses its ears to hear if there is a predator nearby and its vision to watch for predators.

How they figure it out: Students do hands-on investigations with their own senses to learn that information travels to them from their environment. They read about what senses different animals use to find their food. Through a Mystery Box activity, students learn that we need light to see.

Chapter 2: How does light allow a Tokay gecko to see its prey?

Students figure out: First, light travels from a source to the gecko's prey. Then, it reflects off the prey and travels to the gecko's eyes. As it travels from the prey to the gecko's eyes, it carries information about the prey.

How they figure it out: Students use the *Vision and Light* Simulation to explore the path of light from a source to an object and to an animal's eye, a process that is necessary for the animal to see. Students confront several common misconceptions about the role of light in vision by improving inaccurate models of how light reaches the eye.

Chapter 3: How does a Tokay gecko know that it is looking at its prey?

Students figure out: Light from a source reflects off the prey and travels to the Tokay gecko's eyes. The light enters the eye through the pupil and then reaches light receptors. The light receptors respond to the light and send information from the light to the brain. The brain processes this information and forms an image. By comparing the image to memories, the gecko can recognize what it is looking at and make a decision that might help it survive.

How they figure it out: Through research in the Simulation and *Handbook of Animal Eyes*, students learn that light enters the eye through the pupil and then reaches light receptors. These light receptors respond and send information to the brain. Students return to the Simulation to investigate how a predator knows if it's looking at prey or at an animal that would be toxic to eat.

Chapter 4: How could more light at night make it hard for a Tokay gecko to see its prey?

Students figure out: When light gets to a Tokay gecko's eyes, the gecko's light receptors respond and send information to the brain. The brain processes this information to form an image. Since the highway lights were installed, there is much more light at night. Tokay geckos have light receptors that form clear images in very low-light conditions, so the extra light at night makes it difficult for them to form clear images of their prey.

How they figure it out: Students use an informational text to learn that different animals sense information in different ways due to having specialized receptors with varying sensitivities. Students use the Simulation along with a digital model to compare the vision of nocturnal and diurnal animals in differing amounts of light. They build physical models of nocturnal and diurnal eyes and use them to explain the role of light in vision and survival.

Chapter 5: How do our senses help us understand our environment?

Students figure out: By designing an investigation that only changes one variable at a time, it's possible to understand how human structures and receptors inform our senses and help us survive.

How they figure it out: Using a jigsaw approach, groups of students design, conduct, and share the results of hands-on investigations into one of three human senses: hearing, smell, or touch. The shared results of multiple investigations allow students to learn about other senses and to compare the results of multiple investigations.

Chapters at a Glance

Unit Question

How do animals use vision and other senses to survive in their environment?

Chapter 1: How does a Tokay gecko get information about its environment?

Chapter Question

How does a Tokay gecko get information about its environment?

Investigation Questions

- How do animals use their senses to get information about their environment? (1.1, 1.2, 1.3, 1.4)

Key Concepts

- Animals have different structures that allow them to get information from their environment. (1.3)
- Sound and scent can carry information about the environment to an animal. (1.3)
- Animals have different structures that allow them to get information from their environment, which helps them survive. (1.4)
- Light, sound, and scent can carry information about the environment to an animal. (1.4)

Chapter 2: How does light allow a Tokay gecko to see its prey?

Chapter Question

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

Investigation Questions

- How does light allow an animal to see something? (2.1, 2.2, 2.3, 2.4, 2.5)

Key Concepts

- Light needs to get to an object for an animal to see the object. (2.3)
- Light needs to reflect off an object and get to the eye for an animal to see the object. (2.4)

Chapter 3: How does a Tokay gecko know that it is looking at its prey?

Chapter Question

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

Investigation Questions

- How do an animal's structures allow it to see its prey? (3.1, 3.2, 3.3, 3.5)
- How do animals know how to react when they get information about their environment? (3.4, 3.5)

Key Concepts

- When scientists change only one variable in an investigation, they can figure out if it makes a difference. (3.2)
- Light receptors in the eye respond to light and send information to the brain. The brain processes this information to form an image. (3.3)
- After forming an image, the brain compares the image to memories. Then an animal can make a decision that could help it survive. (3.4)

Chapter 4: How could more light at night make it hard for a Tokay gecko to see its prey?

Chapter Question

How could more light at night make it hard for a Tokay gecko to see its prey?

Investigation Questions

- Why do different animals need different amounts of light to see well? (4.2, 4.3, 4.4, 4.5)

Key Concepts

- Different animals can have light receptors with different sensitivities. The brain cannot form a clear image if there is too much or too little light for the type of receptors an animal has. (4.4)

Chapter 5: How do our senses help us understand our environment?

Chapter Question

How do our senses help us understand our environment?

Progress Build

A Progress Build describes the way in which students' explanations of the central phenomena should develop and deepen over the course of a unit. It is an important tool in understanding the design of the unit and in supporting students' learning. A Progress Build organizes the sequence of instruction, defines the focus of the assessments, and grounds inferences about students' understanding of the content, specifically at each of the Critical Juncture Assessments found throughout the unit. A Critical Juncture Assessment guides the instruction designed to address specific gaps in students' understanding. This document will serve as an overview of the *Vision and Light* Progress Build. Since the Progress Build is an increasingly complex yet integrated explanation, we represent it below by including the new ideas for each level in bold.

In the *Vision and Light* unit, students will learn to construct scientific explanations about how animals use vision and other senses to survive in their environment.

Prior knowledge (preconceptions): Students are expected to have had many everyday experiences using their senses to see, smell, hear, taste, and touch. Students are likely to understand that animals need to find food and avoid being eaten to survive in their environment. While these ideas are not necessary for students to participate fully in the unit, having exposure to them will prepare students well for what they will be learning.

Progress Build Level 1: Animals use senses to learn about their environment.

Animals have sensory structures that allow them to learn about their environment by getting information from it. Learning about the environment helps animals survive.

Progress Build Level 2: Light allows objects in an environment to become visible to the eye.

Animals have sensory structures that allow them to learn about their environment by getting information from it. Learning about the environment helps animals survive. **In order for an animal to get visual information about an object in its environment, light from a source needs to get to the object, reflect off it, and get to the animal's eye with information about the object.**

Progress Build Level 3: Light receptors in the eye respond to light and the brain forms an image.

Animals have sensory structures that allow them to learn about their environment by getting information from it. Learning about the environment helps animals survive. In order for an animal to get visual information about an object in its environment, light from a source needs to get to the object, reflect off it, and get to the animal's eye with information about the object. **After light from the object enters the animal's eye, it hits the light receptors in the eye that respond to the light. The light receptors then send the information about the object from the light to the brain, which processes the information to form an image of the object. Then the brain compares this image to memories to decide which action to take.**

Progress Build Level 4: Different animals have light receptors with different sensitivities to light.

Animals have sensory structures that allow them to learn about their environment by getting information from it. Learning about the environment helps animals survive. In order for an animal to get visual information about an object in its environment, light from a source needs to get to the object, reflect off it, and get to the animal's eye with information about the object. After light from the object enters the animal's eye, it hits the light receptors in the eye that

respond to the light. The light receptors then send the information about the object from the light to the brain, which processes the information to form an image of the object. Then the brain compares this image to memories to decide which action to take. **The amount of light that the light receptors need in order for the brain to form a clear image is different for different kinds of animals. This is because different kinds of animals have light receptors that are sensitive to different amounts of light. If there is too much or too little light for the type of light receptors an animal has, its brain cannot form a clear image.**

Guided Unit Internalization Planner

Part 1: Unit-level internalization

Unit title:

What is the phenomenon students are investigating in your unit?	
Unit Question:	**Student role:**
By the end of the unit, students figure out ...	
What science ideas do students need to figure out in order to explain the phenomenon?	

Part 2: Chapter-level internalization

Chapter Question:	
What key concepts do students construct in this chapter?	**How do students apply the key concepts to answer the Chapter Question? To solve the phenomenon?**

Part 3: Lesson-level Internalization

Day _____

Minutes for science: _____

Instructional format:
- ☐ Asynchronous
- ☐ Synchronous

Lesson or part of lesson:

Mode of instruction:
- ❏ Preview
- ❏ Review
- ❏ Teach full lesson live
- ❏ Teach using synchronous suggestions
- ❏ Students work independently using:
  - ❏ @Home Packet
  - ❏ @Home Slides and @Home Student Sheets
  - ❏ @Home Videos

Students will…	**Teacher will…**

Minutes for science: _____

Instructional format:
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- ☐ Synchronous

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Students will…	**Teacher will…**

Look at the *Students will* columns. What are students working in the lesson(s) that you could collect, review, or provide feedback on?
See Some Types of Written Work in Amplify Science to the right for guidance.

If there isn't a work product listed above, do you want to add one? Make notes below.

Some Types of Written Work in Amplify Science

- Daily written reflections
- Homework tasks
- Investigation notebook pages
- Written explanations (typically at the end of Chapter)
- Diagrams
- Recording pages for Sim uses, investigations, etc

How will students submit this work product to you?
See the Completing and Submitting Written Work tables to the right for guidance on how students can complete and submit work.

Completing Written Work	**Submitting Written Work**
• Plain paper and pencil (videos include prompts for setup) • (6-8) Student platform • Investigation Notebook • Record video or audio file describing work/answering prompt • Teacher-created digital format (Google Classroom, etc)	• Take a picture with a smartphone and email or text to teacher • Through teacher-created digital format • During in-school time (hybrid model) or lunch/materials pick-up times • (6-8) Hand-in button on student platform

How will you differentiate this lesson for diverse learners? (Navigate to the lesson level on the standard Amplify Science platform and click on differentiation in the left menu.)

Day _____

Minutes for science: _____

Instructional format:

☐ Asynchronous
☐ Synchronous

Lesson or part of lesson:

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Students will…	Teacher will…

Minutes for science: _____

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Suggestions for synchronous time

The following are some ideas for making the most of synchronous time with your students. As a general rule, the best way to use your synchronous time is to provide students opportunities to talk to one another, or to observe or visualize things they could not do independently.

Online synchronous time	Notes
Online discussions: It's worthwhile to establish norms and routines for online discussions in science to ensure equity of voice, turn-taking, etc. **Digital tool demonstrations:** You can share your screen and demonstrate, or invite your students to share their screen and think-aloud as they use a Simulation or other digital tool. **Interactive read-alouds**: Screen share a digital book or article, and pause to ask questions and invite discussion as you would in the classroom. **Shared Writing:** This is a great opportunity for a collaborative document that all your students can contribute to. **Co-constructed class charts:** You can create digital charts, or create physical charts in your home with student input.	

@Home Resources Scavenger Hunt

Directions: Use this scavenger hunt to practice navigating the Program Hub and decide which @Home Resources best supports your current instructional needs.

Part 1: @Home Units Task	**Notes**
Navigate to the @Home Unit resources. ● Select Remote learning: Amplify Science @Home ● Select Grade-level resources → Grade-level → Unit	
How long is each @Home lesson? Hint: Teacher Overview	
Which types of activities are recommended for synchronous and in-person learning? Hint: Teacher Overview	
How many @Home lessons are in Chapter 1 of your unit? Hint: Teacher Overview	
In which lesson is your unit's phenomenon introduced? Hint: Teacher Overview	
How does the @Home Packet for Lesson 1 differ from the @Home Slides for that same lesson? Hint: Student Materials	
When would you use @Home Student Sheets? Hint: Teacher Overview	
How does the @Home Family Overview support caregivers? Hint: Family Overview	

Part 2: @Home Videos Task	**Notes**
Navigate to the @Home Unit resources. ● Select Remote learning: Amplify Science @Home ● Select Grade-level resources → Grade-level → Unit ● Scroll down to the @Home Video Playlist ● Select the lesson in which the problem or phenomenon is introduced	
Describe the phenomenon (or observable event, something that students can see or experience) in your unit.	

Notes