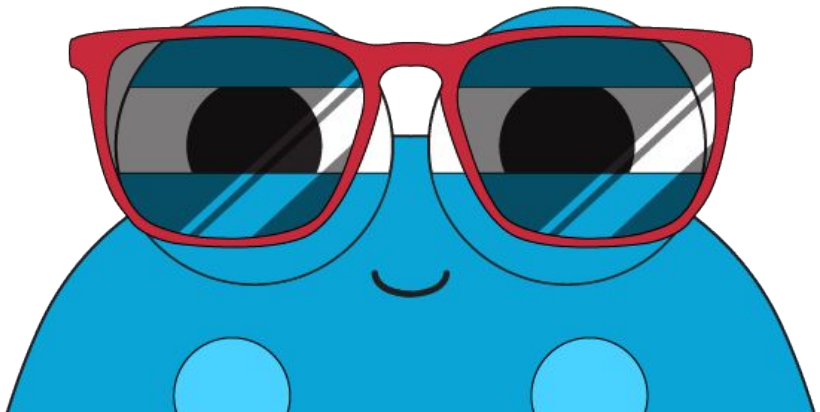
RPA TREKs™ science

Proven Solution for Practice, Intervention and STAAR® Prep

TREKs for STAAR® Readiness, Grade 5

INFORMATION GUIDE

Supplemental Science Solution for Practice, Intervention & STAAR® Preparation



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Information Guide

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What is RPA TREKs?

RPA TREKs is a supplemental 5th grade Science curriculum for targeted practice, intervention and test preparation. Steeped in the science of successful learning, our Recall-Practice-Apply (RPA) model streamlines interleaved practice to meet all learners' needs. Our varied, engaging and interactive lessons are designed in units, or TREKs, that seamlessly integrate prerequisite knowledge, three-dimensional scientific investigation models, STEAM extensions, cross-curricular science and reading literacy, and problem solving. TREKs segments are ready-to-use, designed for durable learning, and align with requirements of the newly designed STAAR.®

- The **Recall** segment reviews prior knowledge relative to the appropriate 3rd and 4th grade Science TEKS standards. Thus, it activates schema, reviews previous vocabulary in context and application and bridges content knowledge and skills to the appropriate 5th grade TEKS standard as practiced in Practice A, Practice B and Apply.

- The **Practice A** segment provides practice with descriptive and experimental investigation types that align to and thread three-dimensional connections between content, scientific and engineering practices and recurring themes and practices.

- The **Practice B** segment features Science story arcs via second-hand investigations in the field and lab, promotes science literacy and integrates reading skills.

- The **Apply** segment highlights real-world scenarios, cultivates solution-oriented learning and applies the Claim-Evidence-Reasoning model.

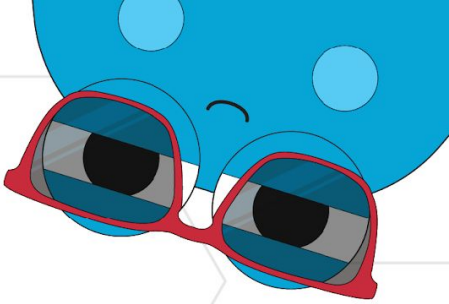
100% of the 5th grade Texas Essential Knowledge and Skills (TEKS) standards and English Language Proficiency Standards (ELPS) are addressed across across 17 TREKs and 68 activities. Teachers can scaffold each segment of a TREK consecutively or just in time to address the needs of struggling learners as well as those ready for extensions and acceleration. This accommodates supplemental, differentiated instructional support for flexible grouping and multiple types of practices.

Professional development is available to facilitate use of RPA TREKs as well as training relative to special topics, including the significant shifts in the Science standards and instruction.

See the remainder of this document to learn more and explore. Happy TREKing!

RPA TREKs™

Versatile Lessons for Versatile Classrooms™



Bring 5th grade students to new heights with innovation and integration. Learn more with the Recall, Practice, and Apply Framework in TREKs!

Versatile Lessons for Versatile Classrooms

TREKs segments are ready-to-use in daily lessons, student practice, intervention, test prep, and other instructional approaches. Implement varied, engaging and interactive activities in all classroom settings and for all learners across the school year.

Designed for Durable Learning™

Steeped in research, the Recall-Practice-Apply (RPA) framework is designed for interleaved practice. Innovate student retrieval and retention with spacing to interrupt forgetting and improve student learning outcomes.

On-Target for STAAR® 2.0 Success

Our expert STAAR® analysis is the backbone for RPA and each segment of TREKs. We know where students struggle most with essential knowledge and skills. Our content and context seamlessly align with the new question types in STAAR® 2.0.

The RPA Framework and TREK Segments

Recall

Review Prior Knowledge

- Activates schema
- Reviews previous vocabulary in context
- Connects self to content

Practice A

Scientific Investigation and STEAM Extension

- Provides varied investigation types
- Scaffolds data interpretation and other process skills
- Integrates math skills

Practice B

Active Reading & Reflection

- Features second-hand investigations in the field and lab
- Promotes science literacy
- Integrates reading skills

Apply

Problem-Solving Mission

- Highlights real-world scenarios
- Cultivates solution-oriented learning
- Applies Claim-Evidence-Reasoning model

Our low-prep Recall-Practice-Apply (RPA) TREKs supplemental learning model streamlines reteaching and is designed by teachers for versatile delivery for any classroom setting and all learners' needs.

Learn more and sample at rpatreks.com.

TREK COMPONENTS

RPA TREKs is a supplemental Science solution for practice, intervention and STAAR preparation. TREKs are 100% aligned to the Grade 5 Science Texas Essential Knowledge and Skills (TEKS) and English Language Proficiency Standards (ELPS) to bring you versatile lessons for versatile classrooms.

Each TREK includes teacher and student components in an easy-to-use digital platform with an Overview, Teacher Instructions, and *Digital Student Journal.* TREKs are organized into segments called Recall, Practice A, Practice B, and Apply.

Overview for each TREK includes:

- Central Concepts and Misconceptions
- Segment Titles and Activities Descriptions
- Standards Alignment Summary
  - Science Content TEKS
  - Scientific & Engineering Practices and 3D Learning
  - Recurring Themes & Concepts
  - English Language Proficiency Standards (ELPS)
  - English Language Arts Reading TEKS
  - Math TEKS

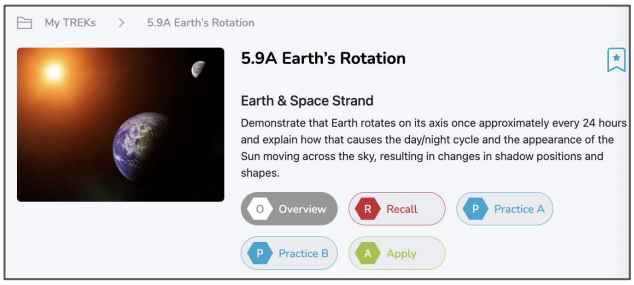
Teacher Instructions for each Segment
Comprehensive implementation tips and answer keys

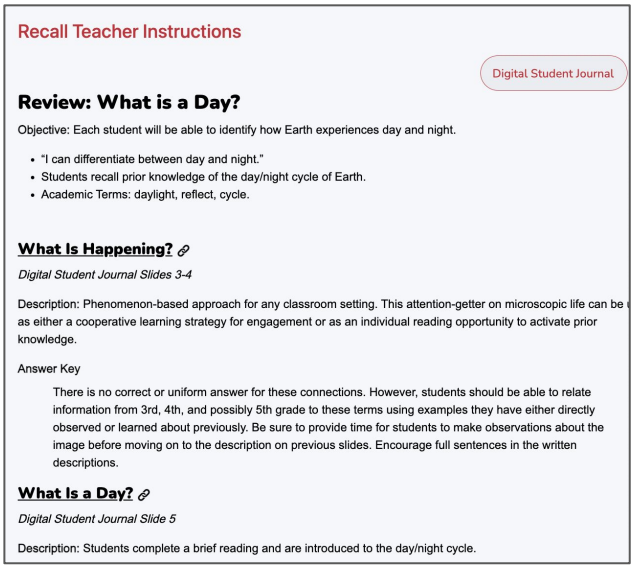
- Vertical alignment of objectives, 'I can' statements, and academic terms
- Embedded ELPS, Scientific & Engineering Practices and Recurring Themes & Concepts Spotlights
- Segments can be assigned separately for differentiated instruction, practice, intervention and test prep

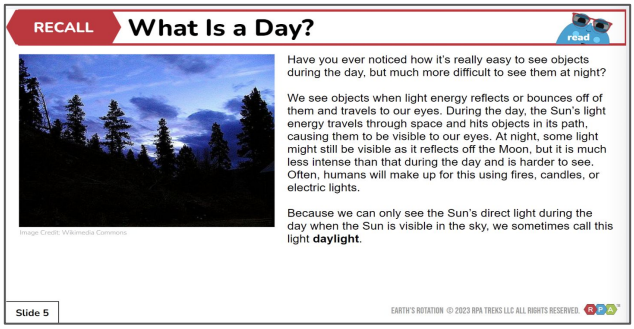
Digital Student Journal
Innovative and interactive activities and assessments

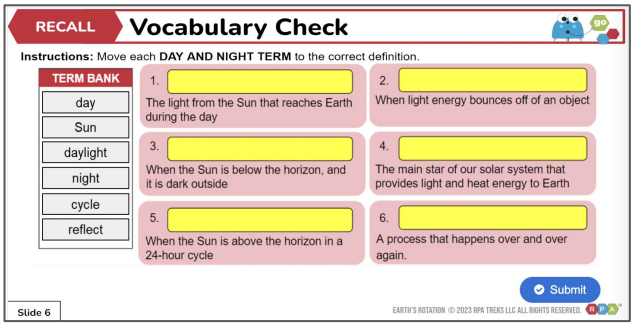
- Easily projected for whole group, small group and independent practice
- Individually assigned for each segment with instant and continual teacher feedback features
- Interactive responses aligned to various new STAAR® question types

Printed Student Journal ***Coming Fall 2024***
Print-friendly booklet with activities presented parallel to the *Digital Student Journal*.









TREKs PREPARATION

TREKs support versatile classrooms with interactive lessons that require no extra materials. Together with comprehensive teacher guidance, implementation tips, and multiple opportunities for practice, TREKs support a wide range of needs in 5th grade classrooms. TREKs are supplemental solutions for practice, intervention and STAAR® preparation.

Supplementing TREKs Segments Within 5E Lessons

Integrate our supplemental activities in 5E lessons per an existing comprehensive program when needed. Engage students with Recall, encourage Exploration, Explanation and Elaboration with Practice A and Practice B. Finally, culminate Elaboration and Evaluation with the Apply segment.

5E Lesson Planning

Independent Practice

Interleaving Practice with TREKs for Successful Learning

Interrupt forgetting by interleaving practice of concepts and skills over time. Recall, Practice A, Practice B, and Apply segments are scaffolded and standards-aligned. Segments are designed to be assigned before, during, and after primary content using the Assignments feature. See the “TREKs Scope & Sequence At-A-Glance” and “TREKs Suggested Scope & Sequence Interleaved Practice” in this guide for a sample planning calendar.

Small Group Instruction

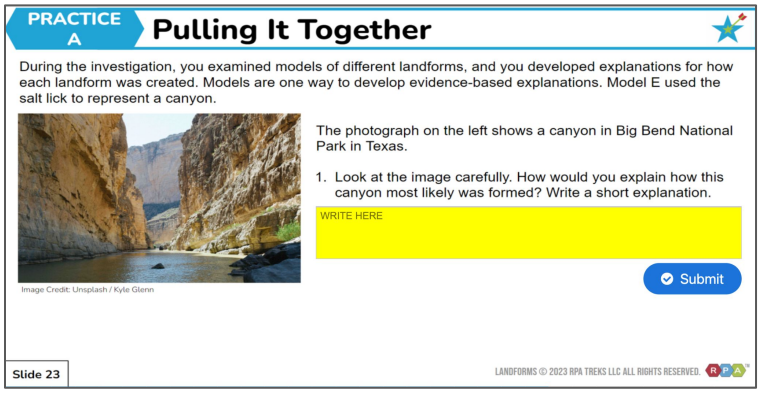
STAAR® Bootcamp

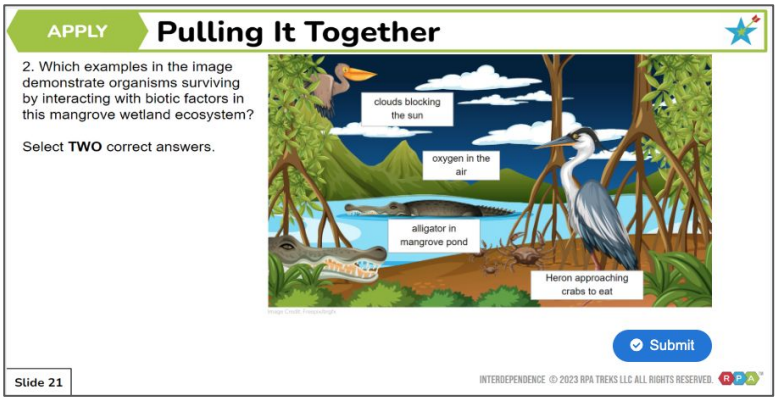
Addressing Intervention in One-to-One and Small Group Instruction

Bring teachers’ data of gaps in student understanding together with TREKs segments to plan Tier 2 and Tier 3 support. The Assignments feature in our platform makes it easy to assign activities and monitor progress from individual students to small groups. With the addition of the Grading feature, teachers can supervise student performance with automated scores, provide scoring relative to open-ended activities, and submit immediate essential feedback.

Preparing for STAAR® with TREKs

Our expert STAAR® analysis strongly informs the design and standards-alignment for each TREK segment. Formative assessments in the *Pulling It Together* section of Practice A, Practice B, and Apply are optimized to reflect the context and the new question types in STAAR® redesign. Similar functionalities for the new question types, including hotspot, hot text, drag and drop, multiselect, multipart, and short-constructed response question types are dispersed throughout the segments.



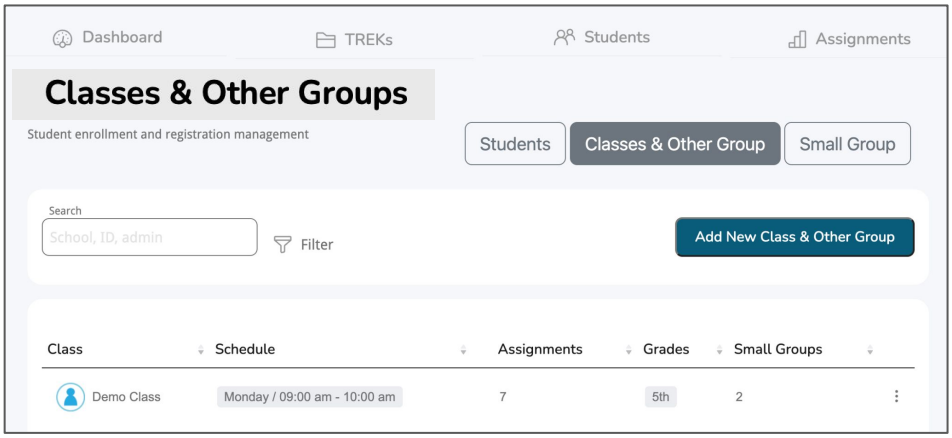


PORTAL FEATURES

For optimal performance, we recommending using up-to-date versions of Google Chrome® and Firefox®.

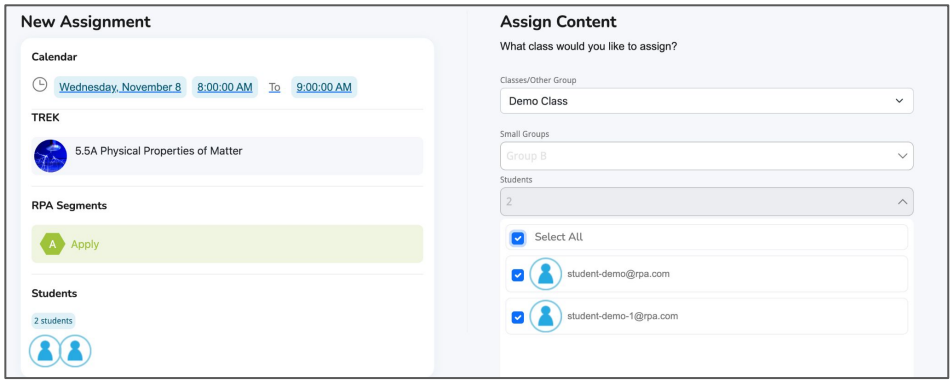
Managing Students

The RPA TREKs portal allows teachers to add individual student accounts and create classes and small groups using the Students feature.



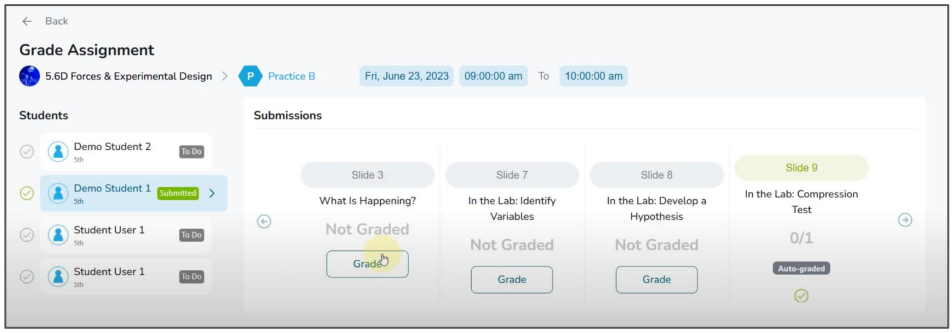
Managing Assignments

The Assignments feature in our platform allows teachers to assign any segment to individual students as well as small and whole groups.



Managing Grading

The Grading feature is embedded in the Assignments feature. After a student has submitted their responses for a segment assignment, teachers can review their answers. Teacher-to-student feedback is also available in this feature.



Most student answers are auto-graded. However, short-constructed response and other open-ended items are manually graded by the teacher. Possible point values for each activity vary, depending on its format, and the corresponding Teacher Instructions provides scoring considerations.

Students can go to their *Grades* section to immediately see a summary of the results of auto-graded items. Students will see pending scores for open-ended items that require manual grading by the teacher.

Using the Dashboard, a teacher can review and analyze scores for all of their students to help determine additional assignments and other supports.

TREKs ACCESSIBILITY

Starting school year 2024-2025, the *Digital Student Journals* will be fully transcribed per slide, assuring all student materials are machine-readable. This accessibility supports both reading and responding to the instructional materials. Below are recommendations to further support students needing accommodations.

Oral Administration

Preparation: For students who require more personalized assistance, consider offering oral administration of the assessment. Prior to the assessment, identify the students who will benefit from this accommodation.

Quiet Environment: Ensure the testing environment is quiet and free from distractions to facilitate a comfortable setting for oral administration.

Read Aloud: Sit with the student individually or in a small group and read the assessment questions and answer choices aloud. Remain neutral in tone and pace to provide consistency across all students.

Clarifications: Be prepared to provide clarifications or rephrase questions if students request further explanation. Avoid giving away answers but offer support in understanding the content.

Transcribing for Student Access

Identify Needs: Identify the students who will require transcription support through the dictation tool. These are students who have difficulty typing and need their spoken responses transcribed.

Designate a Scribe: Assign a scribe who can transcribe the student's spoken responses onto the digital platform. This could be the instructor, a teaching assistant, or a peer.

Clear Communication: Ensure that the scribe understands the importance of accurately transcribing the student's responses without altering their meaning.

Review with Student: Once the assessment is transcribed, review the answers with the student to confirm accuracy and make any necessary corrections.

Using a Dictation (Speech-to-Text) Tool

Identify Needs: For students who may have difficulty typing their responses, identify those who require transcribing of their answers.

For dictation, we recommend the use of the Microsoft® Edge browser, Google Chrome® extension *Voice In*, the installed computer operating system Accessibility application, or similar.

Implementation: Before the assessment begins, ensure that each student's computer is set up with a speech-to-text tool. Support the student by providing any training needed for how to use the tool. Instruct the students to navigate to the assessment using the applicable web browser.

Opening the Dictation Tool: Once students are on the assessment page, direct them to the text box where they need to input their response. Instruct the students to open the dictation tool.

Dictating Responses for Transcription: Remind students they will use the microphone and should speak clearly and at a normal pace to ensure accurate transcription.

Completing the Assessment: Once the response is transcribed and edited, students can proceed to the next question or task as usual. Provide support if any technical issues arise or if students encounter challenges during the process.

TREKs SCOPE & SEQUENCE AT-A-GLANCE

Get peers and families on the same page with this sample TREKs calendar. As teachers implement primary Grade 5 Science curriculum materials over the school year, use the supplementary TREKs for enriching and deepening the learning experiences in primary instruction. See the "TREKs Suggested Scope & Sequence Interleaved Practice" for detailed guidance on interleaving practice with various TREKs segments from beginning to end of the instructional calendar.

SEPTEMBER	
Week	Force Motion & Energy
1	
2	
3	5.7A Patterns of Motion
4	5.7B Forces & Experimental Design

JANUARY	
Week	Earth & Space
1	WINTER BREAK
2	5.10A Water Cycle & Weather
3	5.10A / 5.10C Landforms
4	5.10C Landforms

OCTOBER	
Week	Transition to Matter & Energy
1	5.7B Forces & Experimental Design
2	5.6AD Physical Properties of Matter
3	5.6AD Physical Properties of Matter
4	5.6BC Mixtures & Solutions

FEBRUARY	
Week	Complete Earth & Space
1	5.10B Formation of Sedimentary Rocks
2	5.9A Earth's Rotation
3	5.11A Natural Resources
4	5.12A Interdependence

NOVEMBER	
Week	Matter & Energy, Force Motion & Energy
1	5.6BC Mixtures & Solutions
2	5.8A Energy Transformations in Systems
3	HOLIDAY WEEK
4	5.8C Light

MARCH	
Week	Organisms & Environments
1	5.12B Ecosystems & Flow of Energy
2	5.13A Structure & Function
3	SPRING BREAK
4	Interleave 5.13A Structure & Function

DECEMBER	
Week	Force Motion & Energy
1	5.8C Light / 5.8B Complete Circuits
2	5.8B Complete Circuits
3	WINTER BREAK
4	WINTER BREAK

APRIL	
Week	Complete Organisms & Environments
1	5.13B Behavioral Traits
2	5.12C Human Activities in Ecosystems
3	REVIEW
4	REVIEW

Individual independent school district calendars may vary.

TREKs SUGGESTED SCOPE & SEQUENCE WITH INTERLEAVED PRACTICE

RPA TREKs is a supplementary curriculum designed to support research-driven interleaved practice. TREKs enhance sustained learning around the primary curriculum. The lesson scheduling provided outline offers guidance for how to consider implementing each TREK's segments across the school year.

The duration time listed for each TREK segment is approximate. Consider breaking up various segments over more than one class period through assigning extended due dates. The intent is to support students by interacting with TREKs and their segments multiple times.

Suggested TREK Segment Time Duration

R — 20 minutes	P_B — 45 minutes
P_A — 60 minutes	A — 45 minutes

Note that while **Recall** is an intentional review of previous grade-level TEKS, the remaining segments do not necessarily have to be sequenced in the order they have been organized.

For example, **Practice B** could be assigned before **Practice A**; **Apply** could be assigned before **Practice B**. This inherent flexibility allows teachers to adapt and deliver enriching content in the best way for classes, groups, and individual students.

TREKs Name and Associated TEKS

5.6AD Physical Properties of Matter
5.6BC Mixtures & Solutions
5.7A Patterns of Motion
5.7B Forces & Experimental Design
5.8A Energy Transformations in Systems
5.8B Complete Circuits
5.8C Light
5.9A Earth's Rotation
5.10A Water Cycle & Weather
5.10B Formation of Sedimentary Rocks
5.10C Landforms
5.11A Natural Resources
5.12A Interdependence
5.12B Ecosystems & Flow of Energy
5.12C Human Activities in Ecosystems
5.13A Structure & Function
5.13B Behavioral Traits

SEPTEMBER

Week	Primary Curriculum Delivery by TEK
2	5.7A Patterns of Motion
3	5.7A … 5.7B Forces & Exp Designs
4	5.7B … 5.7A Patterns of Motion

OCTOBER

Week	Standard	Interleaved Practice
1	5.7B	5.6AD Physical Properties of Matter
2	5.6AD	5.7B Forces & Exp Designs
3	5.6AD	5.6BC Mixtures & Solutions
4	5.6BC	5.6AD Physical Properties of Matter

NOVEMBER

Week	Standard	Interleaved Practice
1	5.6BC	5.7A Patterns of Motion; 5.8A Energy Trans in Systems
2	5.8A	5.8C Light
3	HOLIDAY WEEK	
4	5.8C	5.8B Complete Circuits

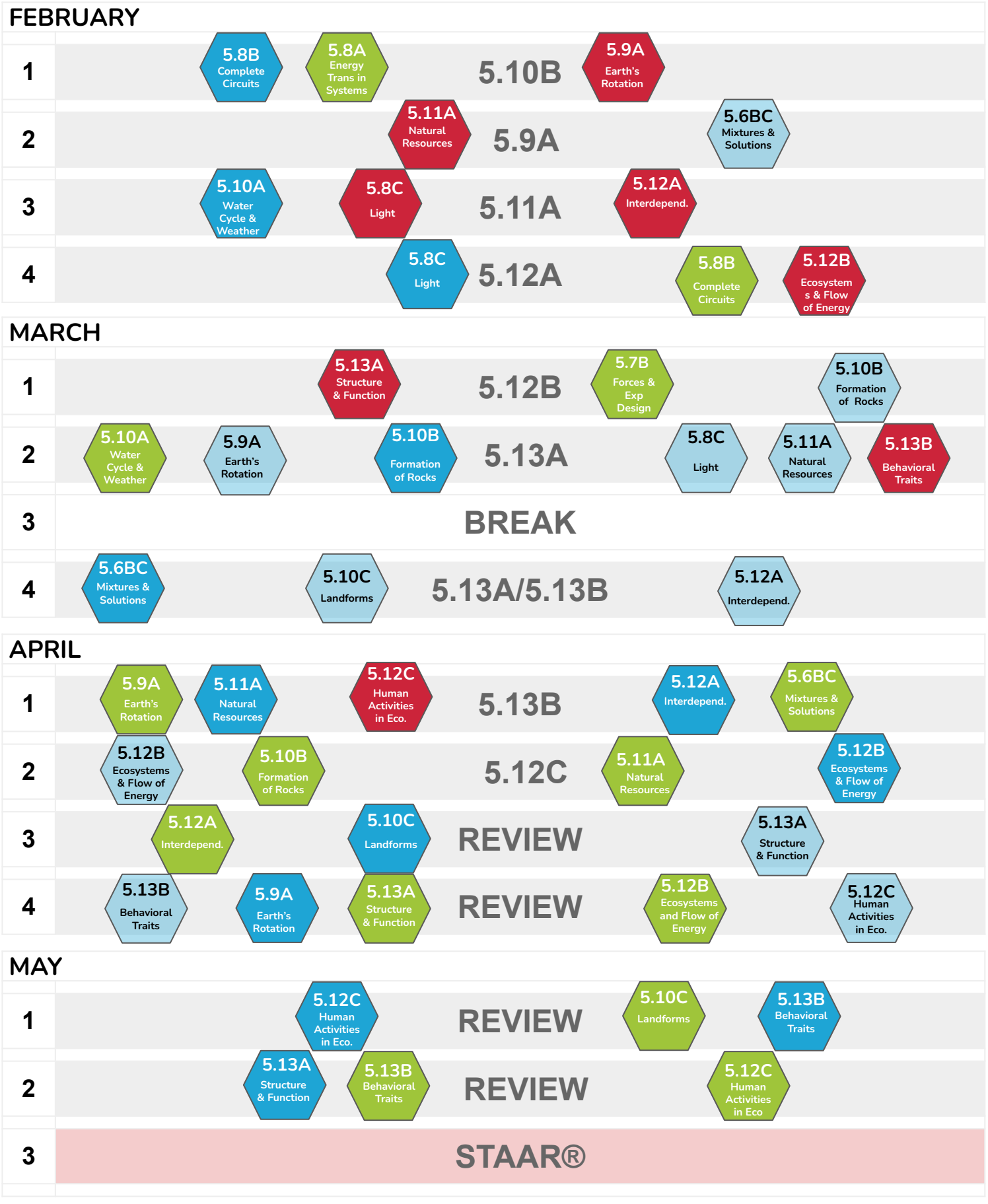
DECEMBER

Week	Standard	Interleaved Practice
1	5.8C/5.8B	5.7B Forces & Exp Designs; 5.7A Patterns of Motion
2	5.8B	5.6AD Physical Properties of Matter; 5.10A Water Cycle & Weather
	WINTER BREAK	

JANUARY

Week	Standard	Interleaved Practice
1	WINTER BREAK	
2	5.10A	5.8B Complete Circuits; 5.10C Landforms; 5.8A Energy Trans in Systems; 5.8C Light
3	5.10A/5.10C	5.6AD Physical Properties of Matter
4	5.10C	5.8A Energy Trans in Systems; 5.10B Formation of Rocks; 5.10A Water Cycle & Weather

TREKs SCOPE & SEQUENCE INTERLEAVED PRACTICE



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Professional Development Services

RPA TREKs provides Science teacher support for any grades Kindergarten through Biology per a multi-perspective framework for improving Science teaching and learning. The professional development series is a comprehensive, intensive, full-year approach that includes teacher training and coaching as well as supplemental options for principals and content leaders/specialists.
The overall support framework consists of four foci:

1. Standards

Science TEKS standards to be taught; this includes the current 2017 standards and the new 2021standards that will be implemented starting SY 2024-2025;

2. Curriculum

RPA TREKs onboarding, vertical alignment documents, year-at-a-glance documents, instructional focus documents (i.e., district lesson plans, teacher-created lesson plans);

3. Instruction

Models, practices, methods and strategies for planning and implementing effective science instruction, including new content teaching, practice, review and intervention; and for reconciling instruction to meet standards relative to classroom, district and STAAR® data; and

4. Assessment

Consistent system to track learning as well as serious attention to the blueprint and question types per STAAR® 2.0 (i.e. drag and drop, multiselect, short constructed response, etc.).

See the next page to learn more about targeted training and coaching options!

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Professional Development Services

Training

Sessions can be designed to explicitly cover the foci as described per the goals of our clients. Options include comprehensive sessions for a singular grade level or multiple grade levels, Science PLC sessions or teacher planning sessions. The minimum time frame for a session is 3 hours and the maximum is 6 hours. See below for targeting training options available now!

Preparing for the New Science TEKS Standards Part 1: What Stays? What Goes? What's New?

What stays? What goes? What's new? In this session, teachers will be able to answer these questions as they study the new Science TEKS standards to be launched in classrooms SY 2024-2025. Per the scientific and engineering practices, recurring themes and concepts, and grade-level content as outlined in the new TEKS, we'll provide clarity and crosswalks for each grade level. Further, we'll define new approaches necessary to integrate all three in Science instruction.

Preparing for the New Science TEKS Standards Part 2: Bridging the Gap in 3D to Connect Practices, Themes and Concepts

The new Science TEKS standards require three-dimensional (3D) teaching and learning. Explore how to guide students through active connections of science concepts with scientific and engineering practices and recurring themes and concepts. Learn new strategies to help students achieve 3D learning as we proceed through a sample lesson, complete with active learning for engagement and rich discourse.

Coaching

Our biggest client success stories are a result of a revolving training-coaching model. We believe excellent educators flourish when effective, consistent coaching is available to practice and perfect research-based methods of teaching and learning. Our personal coaches help teachers understand the standards — across grade levels — and guide their students from knowing to doing. We coach teachers to adopt instructional strategies that are effective without abandoning what makes their style special. We deconstruct practices, methods and ideas into manageable chunks. The result is a teaching approach that is evidence-based and student success that is all their own.

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TREKs for STAAR® Readiness, Grade 5

Sample TREK
5.12A Interdependence (2021)

5.12A Interdependence (2021)

Organisms & Environments Strand Observe and describe how a variety of organisms survive by interacting with biotic and abiotic factors in a healthy ecosystem.

O Overview | R Recall | P Practice A | P Practice B | A Apply

Overview

Side-by-Side TEKS Comparison

2017 Streamlined TEKS	2021 TEKS
5.9A Observe the way organisms live and survive in their ecosystem by interacting with the living and nonliving components.	5.12A Observe and describe how a variety of organisms survive by interacting with biotic and abiotic factors in a healthy ecosystem. • Added “describe” • Added biotic and abiotic factors • Emphasis on “healthy” ecosystems

Central Concepts

- All life depends on basic needs including food, shelter, air, and space for habitat.
- All living, or biotic, organisms interact with other living and nonliving, abiotic, parts of their ecosystems.
- Living organisms rely on the integration of living and nonliving components to grow and reproduce.

Misconceptions

- Dead organisms are considered organic biotic factors in ecosystems, not abiotic. They were once living.
- Students need to understand that populations refer to living things and that a community is made of both the living and nonliving parts of an ecosystem.
- Students should know that one ecosystem or environment can be made of many overlapping habitats. A habitat and ecosystem are not the same thing.
- When space is used as one of the needs of living things, students need to understand that it includes more than an area to live, but an area to find food, water, reproduce and raise young.

Segment Title & Activities Description

- **Recall**
  Review: What Do Living Things Need?
  Students recall prior knowledge of the basic needs of all organisms in their environment with transparent thinking.

- **Practice A**
  Investigation: Rain & Shine
  Students collect and analyze data in a simulated comparative investigation to answer the research question, “How does water affect plant growth?”

- **Practice B**
  In the Field: Billie the Birdwatcher
  Students actively read and reflect as field scientists, support a second-hand field investigation with Billie the Birdwatcher, and identify appropriate habitats for three North American bird species.

- **Apply**
  Mission: The Great Turtle Rescue
  Students embark on a task-based, problem-solving real-world scenario with a mission to release wildlife in a nearby wildlife refuge using habitat maps adapted from Brazoria National Wildlife Refuge of coastal eastern Texas.

Standards Alignment

All standards are based on Texas Essential Knowledge & Skills (TEKS) statements unless otherwise noted.

Looking Ahead: Middle School

- **Science**
  - 6.12A Investigate how organisms and populations in an ecosystem depend on and may compete for biotic factors such as food and abiotic factors such as availability of light and water, range of temperatures, or soil composition.
  - 8.12A Explain how disruptions such as population changes, natural disasters, and human intervention impact the transfer of energy in food webs in ecosystems.

Recall

- **Scientific & Engineering Practices**
  - 3.12A Explain how temperature and precipitation affect animal growth and behavior through migration and hibernation and plant responses through dormancy.
  - 4.12A Investigate and explain how most producers can make their own food using sunlight, water, and carbon dioxide through the cycling of matter.
  - 5.1F Construct appropriate graphic organizers used to collect data, including tables, bar graphs, line graphs, tree maps, concept maps, Venn diagrams, flow charts or sequence

maps, and input-output tables that show cause and effect.

- **English Language Arts and Reading**
  - 5.6E Make connections to personal experiences, ideas in other texts, and society.

Practice A

- **Scientific & Engineering Practices**
  - 5.1A Ask questions and define problems based on observations or information from text, phenomena, models, or investigations.
  - 5.1B Use scientific practices to plan and conduct descriptive and simple experimental investigations and use engineering practices to design solutions to problems.
  - 5.1C Demonstrate safe practices and the use of safety equipment during classroom and field investigations as outlined in Texas Education Agency-approved safety standards;
  - 5.1D use tools, including calculators, microscopes, hand lenses, metric rulers, Celsius thermometers, prisms, concave and convex lenses, laser pointers, mirrors, digital scales, balances, spring scales, graduated cylinders, beakers, hot plates, meter sticks, magnets, collecting nets, notebooks, timing devices, materials for building circuits, materials to support observations of habitats or organisms such as terrariums and aquariums, and materials to support digital data collection such as computers, tablets, and cameras to observe, measure, test, and analyze information.
  - 5.1E Collect observations and measurements as evidence.
  - 5.1F Construct appropriate graphic organizers used to collect data, including tables, bar graphs, line graphs, tree maps, concept maps, Venn diagrams, flow charts or sequence maps, and input-output tables that show cause and effect.
  - 5.1G Develop and use models to represent phenomena, objects, and processes or design a prototype for a solution to a problem.
  - 5.2E Evaluate experimental and engineering designs.
  - 5.3A Develop explanations and propose solutions supported by data and models;
  - 5.3B Communicate explanations and solutions individually and collaboratively in a variety of settings and formats.
  - 5.3C Engage respectfully in scientific discussion.

- **Recurring Themes & Concepts**
  - 5.5A Identify and use patterns to explain scientific phenomena or to design solutions.
  - 5.5B Identify and investigate cause-and-effect relationships to explain scientific phenomena or analyze problems.
  - 5.5D Examine and model the parts of a system and their interdependence in the function of the system.
  - 5.5G Explain how factors or conditions impact stability and change in objects, organisms, and systems.

- **Math**
  - 5.1D Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.

- 5.8C Graph in the first quadrant of the coordinate plane ordered pairs of numbers arising from mathematical and real-world problems, including those generated by number patterns or found in an input-output table.

Practice B

- **Scientific & Engineering Practices**
  - 5.4B Research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field to investigate STEM careers.

- **English Language Arts and Reading**
  - 5.3B Use context within and beyond a sentence to determine the relevant meaning of unfamiliar words or multiple-meaning words (R).
  - 5.6F Make inferences and use evidence to support understanding.
  - 5.6I Monitor comprehension and make adjustments such as re-reading, using background knowledge, asking questions, and annotating when understanding breaks down.
  - 5.7B Write responses that demonstrate understanding of texts, including comparing and contrasting ideas across a variety of sources.

Apply

- **Scientific & Engineering Practices**
  - 5.4B Research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field to investigate STEM careers.

- **Math**
  - 5.8C Ordered pairs of numbers arising from mathematical and real-world problems, including those generated by number patterns or found in an input-output table.

- **English Language Arts and Reading**
  - 5.3B Use context within and beyond a sentence to determine the relevant meaning of unfamiliar words or multiple-meaning words.
  - 5.9E Responses: Recognize characteristics and structures or argumentative text, identifying the claim.

English Language Proficiency Standards (ELPS)

Emergent bilingual students may come from diverse linguistic and cultural backgrounds, and may have varying levels of proficiency in English. The English Language Proficiency Standards (ELPS) provide a framework that is designed to support emergent bilingual students in developing their English language skills while learning academic content across four domains of language development: listening, speaking, reading, and writing. Helpful literacy tasks to support all levels of language acquisition proficiency are included in each segment of this TREK.

General tips for working with emergent bilingual students are provided below.

Listening

- **Provide real-life examples:** Use examples from the students' own experiences to help them connect the concepts to their own lives.
- **Ask clarifying questions:** Encourage students to seek clarification from their peers or teacher on confusing concepts or instructions.
- **Assess Listening Comprehension:** Provide multiple modes of opportunity for students to demonstrate listening comprehension including responding to questions, collaborating with peers, and taking notes.

Speaking

- **Use routine language:** Repeat key vocabulary and phrases multiple times throughout the lesson to reinforce the routine use of complete sentences.
- **Allow for group work:** Encourage students to work in small groups to reinforce the concepts and vocabulary.
- **Assess speaking:** Monitor students as they demonstrate their speaking skills through retelling, giving information, and asking for information.

Reading

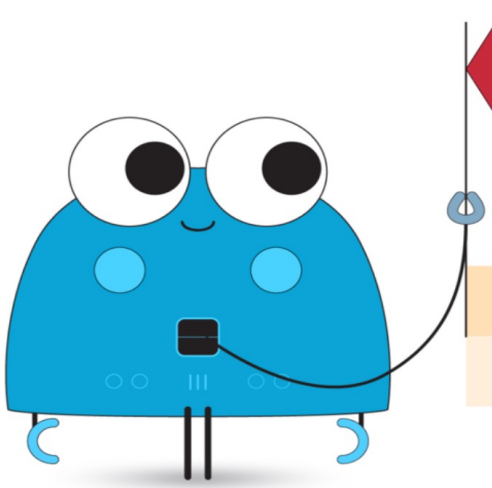
- **Use visual aids:** Use images, diagrams, and videos to help students better understand the concepts being taught.
- **Use graphic organizers:** Use graphic organizers, such as Venn diagrams or concept maps, to help students see the relationships between the basic needs of producers and consumers
- **Incorporate hands-on activities:** Incorporate hands-on activities, such as sorting and categorizing basic needs, to help students better understand and remember the concepts.
- **Use gestures and movements:** Encourage students to use gestures and movements to help reinforce the vocabulary they are learning and ask for help from peers and teachers.

Writing

- **Use sentence frames:** Use sentence frames to help students express their ideas and thoughts in English. This can help them feel more confident and participate more actively in writing assignments.

Learning Strategies

- **Provide positive reinforcement:** Provide positive reinforcement and praise for student efforts and progress in understanding the concepts.
- **Allow for individual practice:** Provide opportunities for individual practice, such as matching definitions with vocabulary words or creating their own examples.
- **Monitor understanding:** Regularly check in with students to assess their understanding of the concepts and vocabulary being taught.



RPA TREKs™

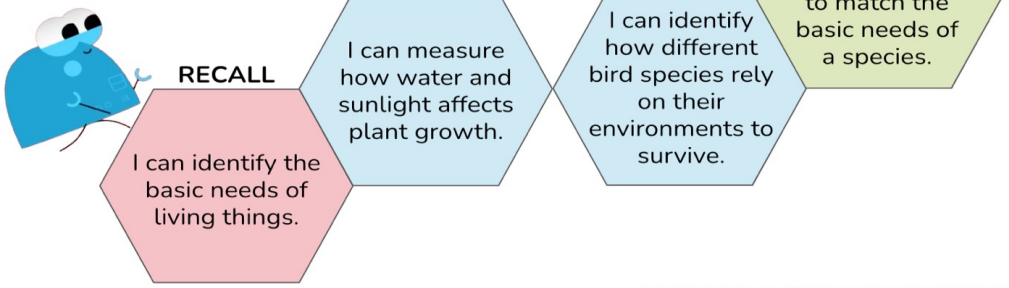
5.12A Interdependence Overview

Slide1

1 / 3

TREK Goals

5.12A: Interdependence
Observe and describe how a variety of organisms survive by interacting with biotic and abiotic factors in a healthy ecosystem.

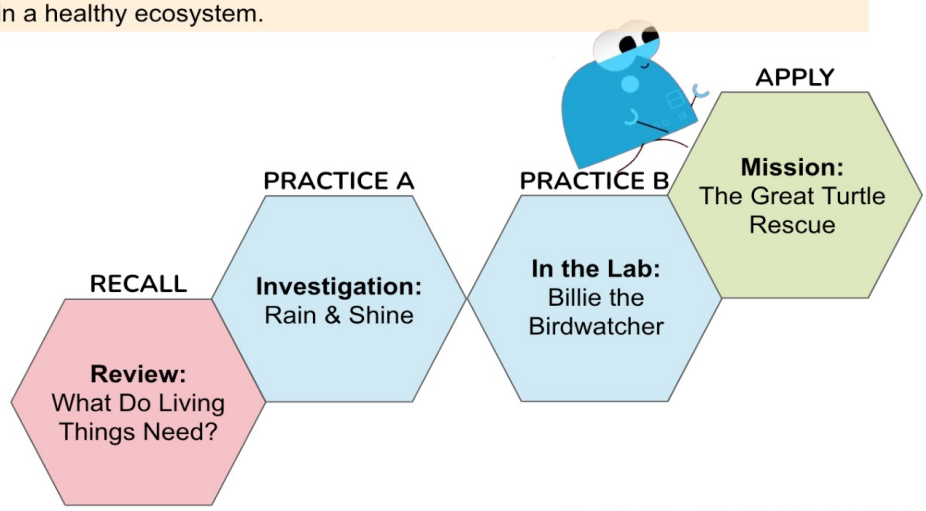


Slide 2

2 / 3

TREK Segments

5.12A: Interdependence
Observe and describe how a variety of organisms survive by interacting with biotic and abiotic factors in a healthy ecosystem.



Slide 3

Recall Teacher Instructions

Review: What Do Living Things Need?

Objective: Each student will be able to identify the basic needs of organisms.

- Students achieve the following 'I can' statement, "I can identify the basic needs of living organisms."
- Students recall prior knowledge of the basic needs of all organisms in their environment.
- Academic Terms: shelter, air, soil, food, water, sunlight, producer, consumer, organism, living component, non-living component, ecosystem.

What Is Happening?

Digital Student Journal Slides 3-4

Description: Students observe phenomena, or observable events, and record their observations. This phenomenon-based approach serves as a hook to retrieve prior knowledge relative to any 3rd and/or 4th grade supporting content TEKS standards. Students will use the same image as they move through a sequence of interrelated tasks, beginning with their basic observations. This attention-getter can be used either as an independent or cooperative learning strategy to activate prior knowledge. Be sure to define that phenomena (or this phenomenon) is an observable event.

Answer Key

There is no correct or uniform answer for this slide. However, students should be able to relate information from 3rd, 4th, and possibly 5th grade to these terms using examples they have either directly observed or learned about previously.

Be sure to provide time for students to make observations about the image before moving on to the description on Slide 4. Encourage full sentences in the written descriptions. Examples include what appears to be a microscopic image through a lens, magnified particles that are blue and red, and unevenly distributed 'gunk' on a slide.

ELPS Spotlight

STRATEGY: Visual Scaffolding

Body Talk: Students will use visual images to identify and describe the basic needs of living things and use gestures that demonstrate how plants fulfill their basic needs.

Instructions:

1. Show the students the five index cards with images related to each basic need (e.g. a tree for "air," a flower for "sunlight," etc.) and ask them to suggest what each image represents in terms of the basic needs of living things. Write their responses on the board.**(Reading)**

2. Hold up each card and ask the students to create a gesture that represents the basic need on the card. For example, they could pretend to take a deep breath for "air" or make a drinking motion for "water."**(Listening and Speaking)**
3. Ask the students to repeat the gesture and say the word associated with the basic need. Repeat this for each of the five cards.
4. Next, ask the students to act out a scenario where a plant is fulfilling its basic needs (e.g. reaching for the sun for "sunlight," soaking up water through its roots for "water," etc.).
5. Have each group present their scenario to the class, using the gestures and words they learned to explain the plant's needs.
6. Have the students work in small groups to create their own sentences that show a plant fulfilling its basic needs. **(Writing)**

ELPS Tips for Beginning EB Students:

- Simplify Language: Use simple language and avoid complex sentence structures when communicating with Beginning EBs. This can help them understand instructions and concepts more easily.
- Provide Sentence Frames: Provide sentence frames for students to complete when discussing their scenarios (for example, "The plant needs _____ to grow.").
- Use Realia: Use real-life examples such as a small plant or seed to demonstrate the basic needs of living things.

ELPS Tips for Intermediate and Advanced EB Students:

- Provide sentence frames for students to use when creating their scenarios (e.g. "The plant needs ___ in order to ___"). Encourage students to use more complex vocabulary and sentence structures when describing the basic needs and plant scenarios.
- Provide opportunities for students to debate and defend their ideas about the importance of each basic need for plants, and how plants can survive in extreme environments.

What Do Living Things Need?

Digital Student Journal Slide 5

Description: Students complete a brief reading and are introduced to relevant terms organism, producers, consumers, abiotic, biotic, and interdependent.

Vocabulary Check

Digital Student Journal Slide 6

Description: Students match terms with their definitions, including shelter, food, sunlight, air, soil, and water. Academic terms are dragged and dropped graphically in relation to each other and definitions. Application of understanding these terms is scaffolded in the next slide as students complete a concept map.

Answer Key

1. Food
2. Sunlight
3. Air
4. Shelter
5. Soil
6. Water

Apply Academic Terms

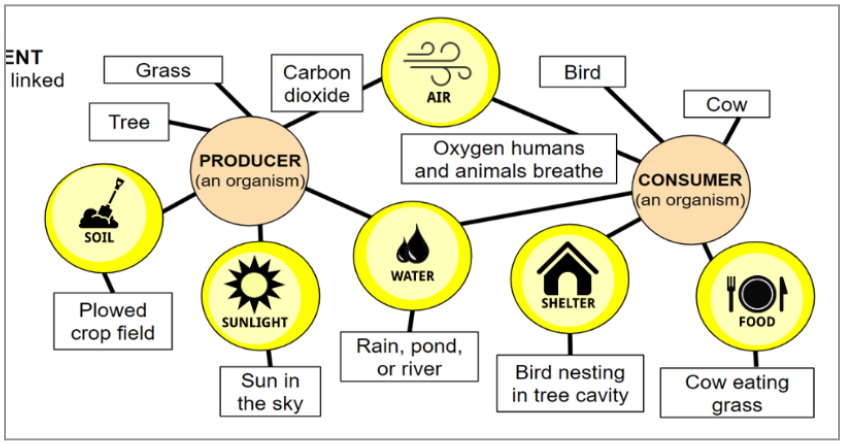
Digital Student Journal Slide 7

Description: Students apply their understanding of the terms to concrete examples. They identify the examples of basic needs of producers and consumers in a farm environment by completing interactive matching in a bubble map.

Previous to 5th grade, students described physical characteristics of environments, such as sunlight, water and soil, and how these basic needs support producers (i.e plants) and consumers (ie. animals). When needed, revisit this with students as they bridge “living” and “biotic” as well as “nonliving” and “abiotic” terms in 5th grade. Students will further practice and apply these terms starting in Practice A of this TREK.

Answer Key

Pictured below.



Connect to You!

Digital Student Journal Slide 8

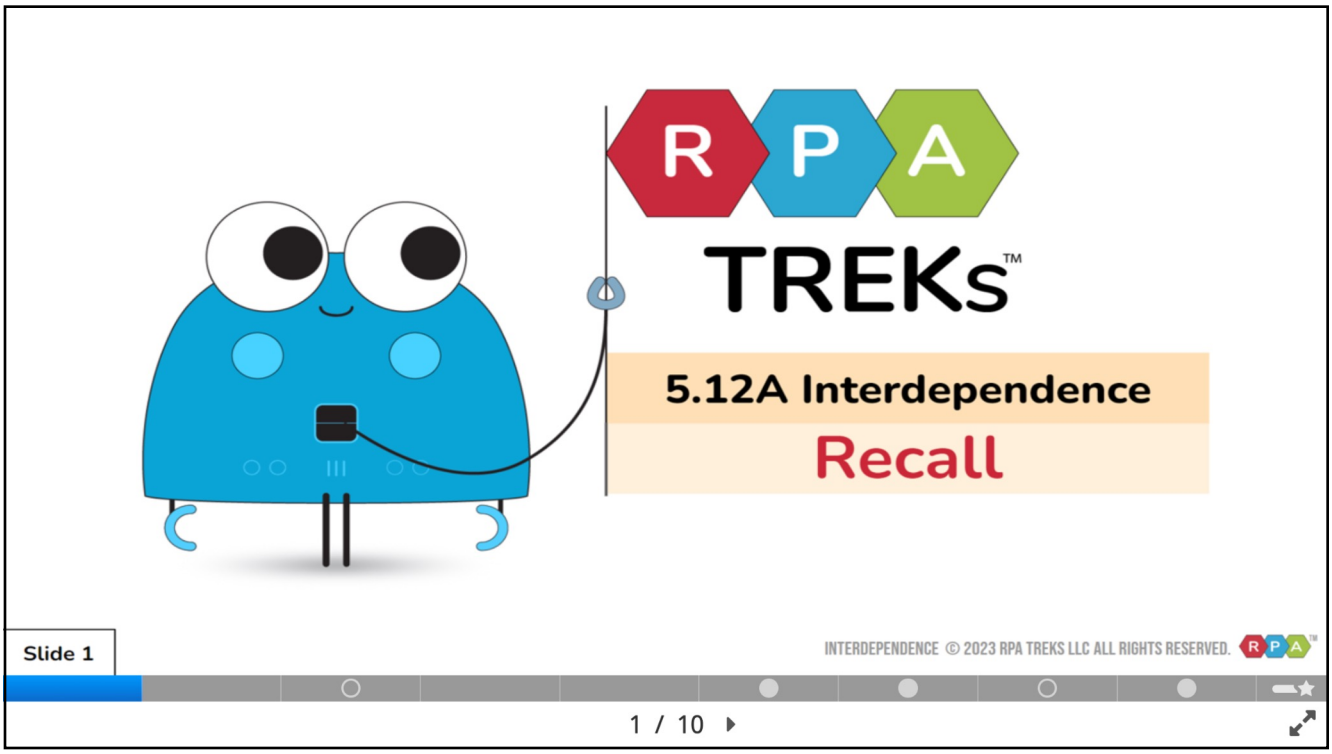
Description: Students write a brief reflection on what they knew about the academic terms up to the present.

This literacy strategy promotes a connection of science to our daily lives. It is another metacognitive vocabulary strategy that elicits connections between the terms and students' experiences. All of our

experiences are different, but can usually be summarized by a quick connection to one or more of the academic terms.

Answer Key

There is no correct or uniform answer for these connections. However, students should be able to relate information from 3rd, 4th, and possibly 5th grade to these terms using examples they have either directly observed or learned about previously. Encourage full sentences in the written descriptions.


R P A
TREKs™
5.12A Interdependence
Recall
Slide 1
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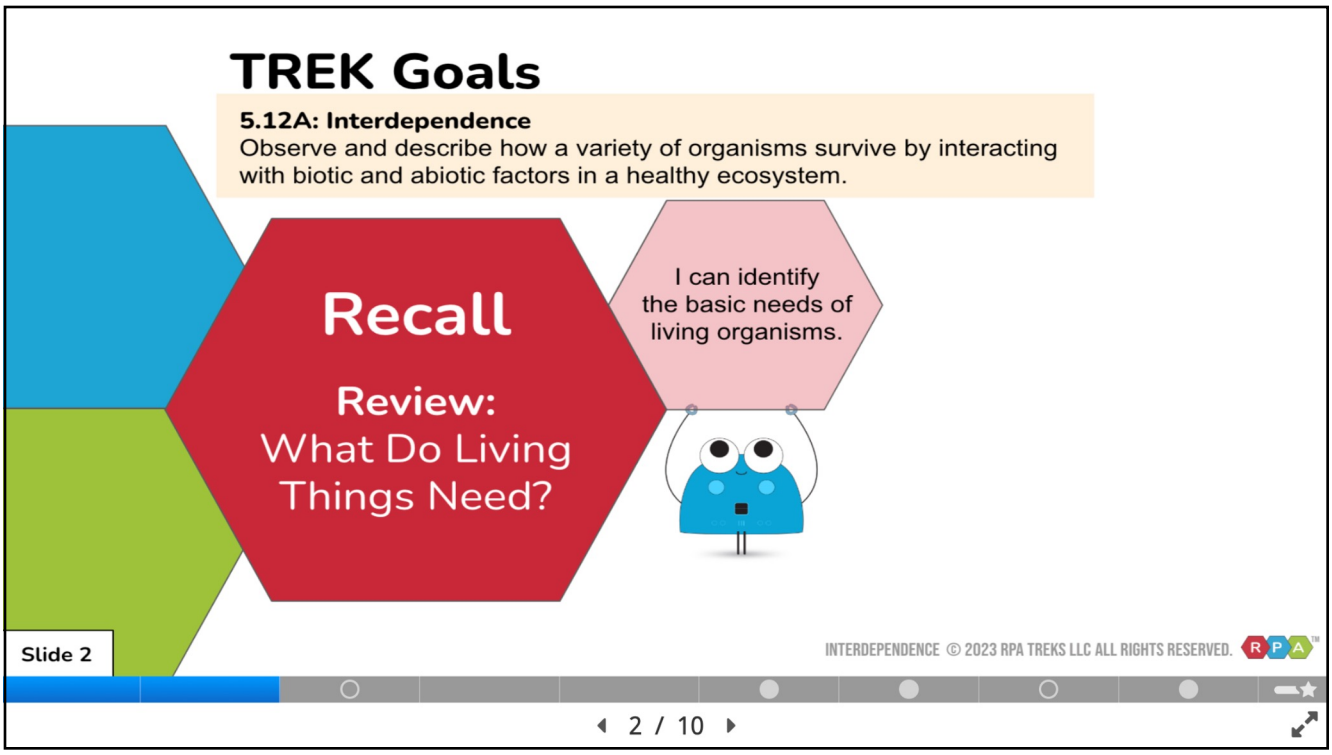
1 / 10


TREK Goals
5.12A: Interdependence
Observe and describe how a variety of organisms survive by interacting with biotic and abiotic factors in a healthy ecosystem.
Recall
Review:
What Do Living Things Need?
I can identify the basic needs of living organisms.
Slide 2
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2 / 10

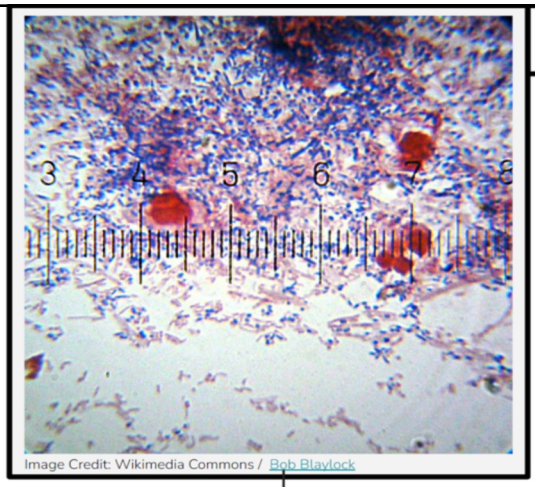


Image Credit: Wikimedia Commons / Bob Blaylock

What Is Happening?

Instructions: Describe what you think is happening in this picture. What do you see? What does it make you think of? What does this make you wonder?

I can think of a microscope.

Submit

Slide 3

3 / 10

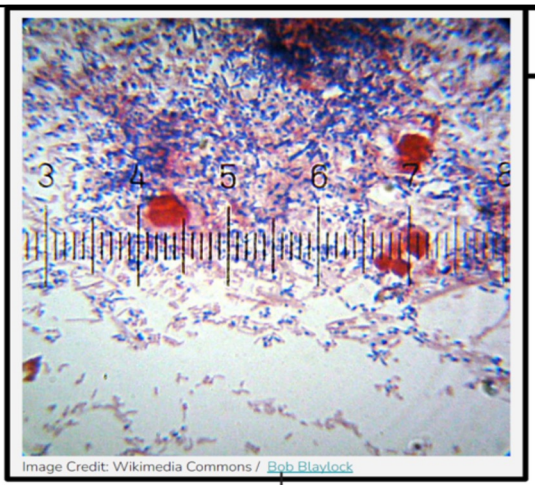


Image Credit: Wikimedia Commons / Bob Blaylock

What Is Happening?

Gunk on your teeth!

This is a microscopic image of *dental plaque,* or the yellow film that builds up on your teeth. It is made up of tiny bacteria that rely on you, another living thing.

For these bacteria, you are a prime place to live! You provide water, food, and shelter to survive and reproduce.

However, these bacteria can damage your teeth. Brushing and flossing keeps bacteria populations low. This is why brushing your teeth and tongue twice a day helps reduce damage over your lifetime.

Slide 4

4 / 10

RECALL

What Do Living Things Need?

Image Credit: Unsplash / Marty Southwell

We all have needs. Every living thing (organism) has some basic needs to be met in order for them to live, grow, repair, and reproduce.

Plants are ***producers***, which means they need sunlight, water, and minerals from the soil to make their own food. Animals are ***consumers***, meaning they need to eat other plants and animals to survive. Other things, like shelter from predators, help keep them alive longer.

In healthy ecosystems, living (*biotic*) and nonliving (*abiotic*) things, or factors, are generally ***interdependent***, or linked to each other. These factors help a variety of organisms survive by helping them meet their basic needs.

Slide 5

5 / 10

RECALL

Vocabulary Check

Instructions: Move each **BASIC NEED COMPONENT** circle to where it matches its definition.

AIR

SUNLIGHT

SOIL — 1. The material that people and animals eat that give them energy to grow, repair, and do things.

SHELTER — 4. Something that covers or protects.

FOOD — 2. The light of the sun; sunshine.

5. A mixture of natural materials that covers much of Earth's surface. Materials include dead plants, dead animals, bacteria, rocks, sand, etc.

WATER — 3. The mixture of gases you can't see or smell that surrounds Earth.

6. A liquid that comes from the clouds as rain and forms streams, lakes, etc.

Submit

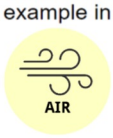
Slide 6

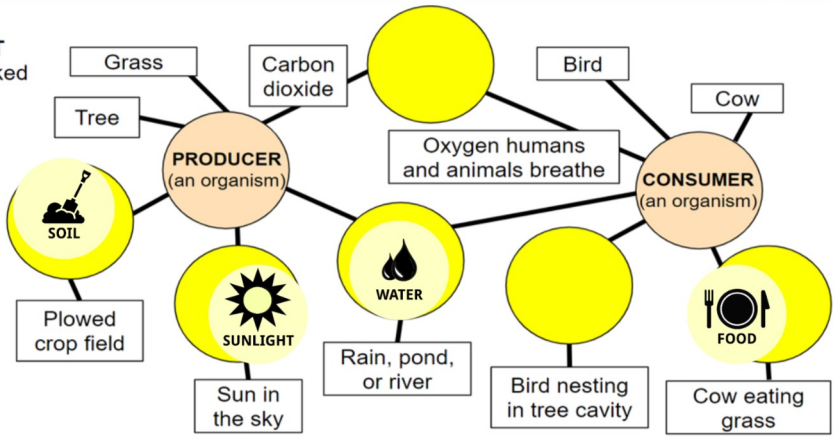
6 / 10

RECALL

Apply Academic Terms

Instructions: Move each **BASIC NEED COMPONENT** circle that matches to the linked example in each square.





Submit

Slide 7

RECALL

Connect to You!

Instructions:

1. Read the vocabulary terms in the Term Bank.
2. Select TWO terms that you know from the Term Bank
3. Write one term in the box labeled A and the other term in the box labeled B.
4. Under each term, write a sentence explaining what you know about the word or words you've selected.

TERM BANK

air	organism
consumer	producer
ecosystem	shelter
food	soil
living thing	sunlight
nonliving thing	water

A

Write here

Submit

B

Write here

Submit

Slide 8

Practice A Teacher Instructions

Investigation: Plant Growth

Objective: Each student will be able to explain the relationship of abiotic and biotic factors in a healthy ecosystem through a model investigation on plant growth.

Students anchor learning in phenomena, plan and conduct an investigation, and develop and communicate explanations and findings in a 3D learning trail. They connect observations and questions of phenomena to develop an explanation and plan an investigation. They collect, analyze and interpret data in a model investigation. Finally, they develop and communicate explanations and findings in a variety of formats and settings.

Previously, students have worked with 3rd and 4th grade concepts of ecosystems without the terms biotic or abiotic. In 5th grade, students now apply the terms biotic and abiotic to the living and nonliving components ecosystems, respectively. In 6th grade, students further investigate these terms and how organisms rely and may compete for biotic and abiotic factors in ecosystems.

- Students achieve the following 'I can' statement, "I can measure how water affects plant growth."
- Students will complete a model investigation anchored in phenomena to help answer the research question, "How does water affect plant growth?"
- Students will make connections between scientific and engineering practices, asking questions anchored in phenomena, collecting data, graphing, analyzing and interpreting data, communicating explanations, and recurring themes of cause-and-effect relationships and system models.
- An optional STEAM Art Extension is included.
- Academic Terms: No new content-related terms are introduced in this segment. Students should be familiar with the components of data tables, x- and y-axes, and ordered pairs.

Print Materials

Custom Investigation Handout

Printable PDF Handout

The *Custom Investigation Handout* (CIH) is an optional printed template for students who complete their own open-ended investigation. The CIH can be used to differentiate students who will plan and conduct individual or small group investigations. The steps and slide numbers of the investigation are the same on the CIH and the *Digital Student Journal.*

Print this double-sided handout in advance for all or some students. Since the slide numbers are synched with the *Digital Student Journal*, students can use their own handout or the *Digital Student*

Journal with guided investigation m. The instructions for the investigation begin on Slide 11's *Investigation: Plant Growth*.

Develop an Explanation Handout

Printable PDF Handout

The *Develop an Explanation Handout* (DEH) is an optional printed template for students to begin on Slide 7 and reference throughout the whole Practice A segment.

Print this single-sided sheet in advance for all or some students, including those who may complete their own investigation using *Custom Investigation Handout* (CIH).

What Is Happening?

Digital Student Journal Slide 4

Description: Students observe phenomena, or observable events. Then, they record as many observations as they can. This discrepant event anchors 3D learning regarding the interaction of living and nonliving factors in ecosystems, scientific and engineering practices, and recurring themes and concepts including patterns.

Scientific & Engineering Practice Spotlight

5.1A Ask questions based on observations or information from text, phenomena, models, or investigations.

- This is the first opportunity for students to record their observations of a phenomenon. This metacognitive process begins in the form of questions.

Anchor Learning in Phenomena: As students begin the model investigation, the phenomenon anchors the concept of interdependence as evident in a plant's self-watering strategy. This is the first point in the 3D learning trail in Practice A. The learning of phenomena is anchored in the following steps:

- Observe and/or read information about phenomena.
- Find patterns.
- Ask questions.
- Develop explanations about phenomena using systems models and/or mathematical calculations.
    - Identify components of the system model.
    - Use connections between parts of the system to describe and make predictions about the phenomena.
    - Identify and describe a scientific cause.
- Determine how to test the model.

Addressing Misconceptions: As students record their observations of the phenomenon in this section, some of them may note how water droplets are on the leaves of the plant. A misconception is that water is absorbed by the leaves of a plant. Another potential misconception is that plants intake water to breathe just like animals - except in reverse - through the leaves. Students revisit this phenomenon after the investigation in the *What Happened?* section, where it will be imperative to emphasize that the droplets pool together and drain down to the plant's roots. Water is absorbed in plant roots. To counteract this misconception throughout the segment, emphasize that the air and water the plants are interacting with are part of a healthy ecosystem.

At this point, students may not understand that plants get water from the roots, not the leaves. This does not have to be clarified at this time of exploration, but will be revisited after the investigation. Be sure to provide uninterrupted time for students to make observations about the image before moving on. Encourage writing in full sentences.

Answer Key

> There is no correct or uniform answer for these connections. Students may note there are droplets of water that are "stuck" in the veins of the green leafy plant. The plant does not appear to be tall and is not woody, so it's not a tree. Students should be able to relate information from 3rd, 4th, and possibly 5th grade to these terms. They may use examples they have either directly observed or learned about previously.

Observe Patterns

Digital Student Journal Slide 5

Description: Students continue to observe the image of the phenomenon. They will do so more intently by identifying patterns they notice and recording quantitative (numerical) and qualitative (descriptive) terms.

Scientific & Engineering Practice Spotlight

5.1A Ask questions based on observations or information from text, phenomena, models, or investigations.

- Students continue to connect their observations to patterns and their personal experiences with the phenomenon of a plant's leaves collecting water.

Recurring Themes & Concepts Spotlight

5.5A Identify and use patterns to explain scientific phenomena or to design solutions.

- Students approach any phenomenon with a consistent approach of making observations and recording any patterns they observe along the way to developing a model of understanding.

Students connect their observations to questions they may have about the phenomena. Ideally, students are experiencing phenomena with all senses (except taste) and recording what they see, smell, and feel. In this format, students record what they see, but consider adding more details about what students might also observe if they were outside in a field of grass or perhaps a farm.

Students identify and use patterns to explain scientific phenomena. Encourage recording quantitative (numeric) and qualitative (descriptive) observations to reinforce the practice of describing all observable events empirically. Consider the following questions to deepen student thinking throughout this section:

- What structures are found in the phenomenon or system after careful observation?
- How could these patterns be represented using the senses?
- How could patterns be used to classify or organize objects and events?

Answer Key

There is no correct or uniform answer for these observations, but anticipated student responses should include more detail than the previous observations. An anticipated student response should note there are dozens of water droplets (quantitative) and the water is clear and the plant is green (qualitative). The plant's structure seems to be "holding" several water droplets in the many folds of the leaves, and the roots or ground are not visible.

Ask Questions

Digital Student Journal Slide 6

Description: Students continue their scientific exploration by asking driving questions about what they wonder about the phenomenon. Students connect their observations to questions they may have about the phenomena.

Scientific & Engineering Practice Spotlight

5.1A Ask questions based on observations or information from text, phenomena, models, or investigations.

- Using the close-up image of the phenomenon, students are encouraged to use their observations to record questions they have about the observable event.

Questions might include wonderings about a plant's structure and its ability to hold water.

Answer Key

There is no correct answer for this slide, and students should be encouraged to write as many questions as possible. Examples include “Where does the water go?” and “How does the plant get the water it needs?”

Develop an Explanation

Digital Student Journal Slides 7-8

Description: Students use a model to develop an explanation of the phenomenon based on the driving question, “Why is water present on the leaves of the plant?” A series of prompts are provided to guide students through the process of developing an explanation. As students work collaboratively to determine a driving question from their observations, provide a sheet of paper, chart paper, or the general *Develop an Explanation Handout* as they enter the next process in the 3D learning method. They use systems models to explain the phenomenon. In this model investigation, a driving question is provided.

Scientific & Engineering Practice Spotlight

5.1G Develop and use models to represent phenomena, objects, and processes or design a prototype for a solution to a problem.

- Students begin to connect the components and identify a scientific cause of the observable event.

Scientific & Engineering Practices Spotlight

5.2E Construct appropriate simple graphs, tables, maps, and charts using technology, including computers, to organize, examine, and evaluate information.

- As students use a model to develop an explanation to connect their observations of phenomena and to cause-and-effect relationships, encourage collaboration in a variety of settings or formats, such as in small groups or partners and sketches on paper. Students may choose tables or charts to organize their thoughts when identifying components, relationships, or connections in their system.

Recurring Themes & Concepts Spotlight

5.5B Identify and investigate cause-and-effect relationships to explain scientific phenomena or analyze problems.

- Students identify that the phenomena is an example of cause and effect because plants need water to live.

Scientific & Engineering Practices Spotlight

5.3B Communicate explanations and solutions individually and collaboratively in a variety of settings and formats.

- Students individually or collaboratively reflect on their working model as they begin developing explanations. The explanations will be communicated upon completion of the investigation. Differentiation by group can be done at this stage or after the investigation.

Ask students the question, "Why is water present on the leaves of the plant?" It is important to note that the driving question is not the research question for this investigation. The driving question is a connection between observations of the phenomenon and planning and conducting an investigation to test the model derived in this step. Further connections are made between the content and cause-and-effect relationships**.**

This process of developing an explanation on Slide 8 is in three steps:

1. Identify the system and its components and their relationships to each other;
2. Use the model to describe and make predictions about the phenomenon; and,
3. Identify and describe a scientific cause.

Students identify the parts of the system and their interdependence in the function of the system. To complete Slide 8, either give students a blank sheet of paper or a copy of the *Develop an Explanation Handout.* Students follow the steps provided and enter their responses in this slide. You do not need to collect this sheet before the investigation begins. It is designed to be referenced throughout the investigation until the *What Happened? s*ection after the investigation.

Slide 8, Answer Key

1 Identify the system and its components and their relationships to each other.

1A System name: Ecosystem
If needed, provide students this system name. Consider discussions on other ideas, such as water cycle or evapotranspiration, in guiding students. The system name of ‘ecosystem’ most closely aligns to demonstrate interaction of living and nonliving things in a system. At this point, students may not understand that the interactions are balanced in a healthy and stable ecosystem

1B Identify the components of the system.
Use a sketch to support your response.
The ecosystem has living and nonliving parts. Have students share their sketches. If needed, students can use the blank side of the *Develop an Explanation Handout.*

1C Identify and describe the relationship between the components.
Students identify and describe the relationship of living and nonliving things in an ecosystem, such as living things relying on non living things to survive.

2 Use the model to describe and make predictions about the phenomenon.
When changes occur in an ecosystem, all other factors are affected. This is because all factors are interconnected in a system. We are only looking at one plant and some water in this ecosystem, so it is a very limited view of the actual more complicated system.

3 Identify and describe a scientific cause.
There must be a cause-and-effect relationship between the water and the plant in a healthy ecosystem. Since a plant requires water to grow, water must be the cause and the effect is its growth.

Determine How to Test the Model

Digital Student Journal Slides 9-10

Description: Students determine the type of investigation that *could* best test the model used to develop an explanation about the phenomenon. While the model investigation provided is experimental, students are provided context for how both descriptive and experimental investigations are significant when studying a healthy ecosystem.

Scientific & Engineering Practice Spotlight

5.1B Use scientific practices to plan and conduct descriptive and simple experimental investigations and use engineering practices to design solutions to problems.

- Students begin to plan how they could investigate and collect evidence in lab or field science.

Recurring Themes & Concepts Spotlight

5.5B Identify and investigate cause-and-effect relationships to explain scientific phenomena or analyze problems.

- Students explain how the relationship of cause and effect relates to the phenomena of plants and water in a healthy ecosystem.

Based on the process of constructing explanations in the *Developing an Explanation* phase of the 3D learning trail, students are engaged in this step of inquiry by developing and using a model. The steps followed in the previous slide extend students' thinking by investigating the phenomenon and moving from "What is Happening?" to "What do you think?" during an investigation. They are not yet provided the research question, but are decided on the type of investigation they'd complete and the evidence

they would collect to explain plant growth. Students are given more context on the Recurring Theme & Concept of cause-and-effect relationships.

Slide 9, Answer Key

Since students could conduct their own investigation starting on Slide 11, they complete this slide as an exercise to select one they think could be best suited for the model investigation. Either answer will be accepted. This is a non-graded slide.

Slide 10, Answer Key

Anticipated student responses should be in a list of as many possible causes for plant growth, soil type, amount of sunlight, temperature, etc.

Investigation: Plant Growth

Digital Student Journal Slides 11-12

Description: Before students are provided the option to plan and conduct their own investigation or continue with the one provided in the *Digital Student Journal*, they complete a drag and drop sort of observable variables. Students then complete a brief reading passage on the scientific concept without gaining too much information to complete the investigation itself. Finally, they are provided with the research question for the model investigation, “How does water affect plant growth?”

Recurring Themes & Concepts Spotlight

5.5D Examine [the parts of a system's] interdependence in the function of the system

- Students connect the measurements of plant growth based on the amount of water added to a system to the concept of interdependence.

Plan and Conduct Investigations: As students transition from phenomenon to investigation in the progression of Practice A, they determine how to test the model and begin the steps below. These steps are the second point of the 3D learning trail for Practice A. They are the key lever for driving learning and student mastery of disciplinary knowledge and skills.

- Establish the cause.
- Identify variables.
- Develop a procedure.
- Identify tools and materials.
- Demonstrate safe practices and use safety equipment.
- Use tools to observe, measure, test and analyze information.
- Collect evidence.
- Construct organizers used to collect data.

After the exercise on this slide, students can either continue through the guided investigation provided in the *Digital Student Journal* or use the *Custom Investigation Handout* to plan and conduct their own student-driven investigation.

Slide 11, Answer Key

- Cause
    - Abiotic factor
    - The amount of water provided per day (mL)
- Effect
    - Biotic factor
    - The amount of plant growth (mm)

Custom Investigation Handout

Printable PDF Download

Description: After constructing an explanation about the phenomenon, students may choose to conduct their own investigation with materials and tools available to them in the classroom. The purpose of the *Custom Investigation Handout* (CIH) is to differentiate instruction and allow for individual, small group, or whole class hands-on investigating using descriptive or experimental investigations. The *Investigation: Plan* through *Investigation: Conclusion* slides are specific to the model investigation and can guide students through the more open-ended steps in the CIH. Alternatively, the CIH can be used separately without the prompts in the *Digital Student Journal.*

The materials provided in the *Investigation: Materials & Tools* section of the *Digital Student Journal* are suggested but can vary based on individual student investigations. For each section of the CIH, be sure to remind students that they are steering their own investigation. Students need to collect evidence during the investigation, identify a claim and link the two with a line of reasoning.

ELPS Spotlight

STRATEGY: Connecting to the Real World

Making Predictions: Students will use new vocabulary and prior knowledge to make predictions.

Instructions:

1. Pair students to read the research question.**(Reading)**
2. Ask students to predict the outcome of the investigation, based on what they know about plants and what the prompt says. They can complete the following sentence frames:
    a. I think the plant will grow more when it gets _____ sunlight because _____.
    b. I think the plant will grow more when it gets _____ water because _____.
    c. I predict that the plant will grow _____ centimeters over the 5 days because _____.
3. Once students have made their predictions, have them share with a partner or small group and discuss their reasoning. **(Listening and Speaking)**
4. As a class, compile a list of the different predictions and have students write about which ones seem most likely based on the information provided in the prompt. **(Writing)**

5. Finally, tell students that they will be conducting the investigation to see if their predictions were correct.

ELPS Tips for Beginning EB students:

- Provide visual aids, such as pictures or diagrams, to help with comprehension of new vocabulary and the research question.
- Simplify the sentence frames by using familiar words and sentence structures.
- Model making predictions by providing examples and scaffolding the thought process.

ELPS Tips for Intermediate and Advanced EB students:

- Encourage the use of sentence frames to support writing and speaking skills.
- Allow for partner or small group discussion to give students the opportunity to practice language skills and receive feedback.
- Provide sentence stems or prompts to guide the discussion.

Investigation: Plan

Digital Student Journal Slide 13

Description: Students use their knowledge of a hypothesis, independent variable and dependent variable, and constants and move the statements into the correct box.

Scientific & Engineering Practices Spotlight

5.1B Use scientific practices to plan and conduct experimental investigations.

- Students using the *Digital Student Journal* will be conducting an experimental investigation as they observe and collect data to help answer a research question. Students preview the procedure of the experimental investigation in order to measure variables associated with water and plant growth.

Experimental science is an interactive way for students to observe and document natural phenomena by manipulating variables and measuring resulting changes. There is a hypothesis in an experimental investigation. When discussing the answers with students, point out that the hypothesis:

- includes both a living (biotic) and nonliving (abiotic) component of the ecosystem, and
- connects the investigative design back to the central concept in which organisms interact with other living and nonliving parts of the ecosystem.

The independent variable is the amount of water (nonliving factor) and the dependent variable is plant growth, or a living factor of the ecosystem. In a healthy ecosystem, plant growth is affected by the amount of water it receives.

Answer Key

Hypothesis	Independent Variable	Dependent Variable	Control Variable
C. Plants that receive enough water will grow more than those that don't.	A. The cause, or amount of water (abiotic factor), provided to the plants.	B. The effect of how much does the plant (biotic factor) grow each week.	D. A third plant is not watered to prove water is growth mechanism.

Investigation: Procedure

Digital Student Journal Slide 14

Description: Students read the steps for this model experimental investigation. They preview a procedure explaining how data will be observed and collected on how plants grow. Students are introduced to the research question for the model investigation, "How does water affect plant growth?" This set of procedures can also serve as the steps followed for students completing the *Custom Investigation Handout*, as needed.

Investigation: Materials & Tools

Digital Student Journal Slide 15

Description: Students read the comprehensive list of materials and select measurement tools used in the model investigation. Then, they provide descriptions of the measurement tools that will be used. Students are prompted to describe the purpose of using each listed tool as it applies to this investigation.

Scientific & Engineering Practices Spotlight

5.1D Use tools to observe, measure, test, and analyze information.

- Students are introduced to the simulation to measure liquid volume with a graduated cylinder in mL, plant growth (distance) in mm, and a hand lens or loupe to make qualitative observations about the plants in general. They may use different materials and tools available if they plan and conduct their own investigation in the *Custom Investigation Handout.*

Students identify and describe how tools are used to make observations and record qualitative and quantitative data.

Answer Key

Graduated cylinder	To measure the liquid volume of water given to each plant (in mL)
Metric Ruler	To measure the distance of daily growth of each plant (in mm)
Hand lens or loupe	Look at plants up close and make qualitative observations.

Investigation: Lab & Field Safety

Digital Student Journal Slides 16-17

Description: Every investigation begins with a review of safety practices and equipment, whether in the classroom lab or field. Students are provided with a comprehensive list to select the appropriate grade-appropriate safety equipment and materials. They are also provided with practices used for this experimental investigation.

Scientific & Engineering Practices Spotlight

5.1C Demonstrate safe practices and the use of safety equipment during classroom and field investigations as outlined in Texas Education Agency-approved safety standards.

- Students completing the *Digital Student Journal* will identify and demonstrate safe practice and the use of lab equipment for this investigation.
- Students planning and conducting their own investigation will complete the “Safety Practices & Equipment” section on the printed *Custom Investigation Handout.*

From the list, students select those items that apply to this particular investigation. They then describe specific safety procedures.

Slide 16, Answer Key
Example provided below. Some answers may vary. This is a manually graded slide.

Wash hands before and after handling materials	Dry and safe electrical outlets for equipment	Wear lab or field gloves	Fire blanket nearby
Ensure proper ventilation	Transportation Plan	Fire extinguisher nearby	Wear protective clothing and closed-toed shoes
Do not enter chemical storage room	Handle glassware carefully to avoid breaking	Repellant and allergy kit	Paper towels to clean lab station
Inform teacher if materials spill or are broken	Do not touch broken glass	Sunscreen, sun protection	Electrical equipment is safely in place to not cause injury or fire
Wear safety goggles	Eyewash station nearby	Wear a lab coat/apron	Get instructions before handling ANY materials
Do not pour chemicals down the drain	First Aid Kit	Appropriate waste disposal can nearby	Individual water bottle
	Make sure area is clear of tripping hazards	Pull back long hair, wear short sleeves, secure loose clothing and jewelry	

Slide 17, Answer Key

How will you place the lamp within the experiment area to avoid personal injury?	Make sure the electrical cord is not placed anywhere someone can trip on it.
How will you help make sure the lamp does not cause a fire?	Make sure it is plugged in properly and that there is nothing (especially things that can catch fire easily, like paper) touching the bulb.

Skills Practice: Observations

Digital Student Journal Slide 18

Description: Students are introduced to a hand lens, or loupe, and how it can be used to look at objects up close.

Scientific & Engineering Practices Spotlight

5.1D Use tools to observe information.

- Students use a hand lens to make qualitative observations of a plant and record as many observations as they can.

This activity is not the same experience as the initial *What is Happening?* activity since students are using a tool to observe objects up close. Observations are the first part of science, and using tools helps us see details in objects. Tools such as telescopes and microscopes help us see objects that are too far away or too small to be seen with the regular eye, respectively.

Answer Key

There are no wrong answers for this slide. Encourage as many full sentences as possible.

Skills Practice: Measure Height

Digital Student Journal Slide 19

Description: Students practice reading a metric ruler to measure plant height after two weeks.

Scientific & Engineering Practices Spotlight

5.1D Use tools to measure information.

- Students use a metric ruler to measure plant growth over time and compare growth of two plants over two weeks.

Measuring distance (in meters) is an important skill in any investigation. The unit of measure for this activity is millimeter, mm.

Answer Key

1. 41 mm
2. 21 mm
3. 8 mm

Skills Practice: Measure Volume

Digital Student Journal Slide 20

Description: Students practice reading a graduated cylinder. They are provided with a basic comparison of using this tool as a ruler for liquid.

Scientific & Engineering Practices Spotlight

5.1D Use tools to measure information.

- Students use a graduated cylinder to measure two different liquids by reading the grids on the cylinder.

Measuring volume (in liters) is an important skill in working with liquids. The unit of measure for this activity is milliliter, mL.

Answer Key

1. 40 mL
2. 20 mL

Skills Practice: Collect Data

Digital Student Journal Slide 21

Description: Students practice placing data into a data table based on changes in plant growth over time.

Scientific & Engineering Practices Spotlight

5.1F Construct appropriate graphic organizers used to collect data, including tables, bar graphs, line graphs, tree maps, concept maps, Venn diagrams, flow charts or sequence maps, and input-output tables that show cause and effect.

- Students are instructed to complete a data table with step-by-step instructions prior to empirical data collection. They connect the observations in a system based on changes to the plants.

As students continue the practice of applying empirical observations in a data table, they see how a natural system is recorded logically.

Answer Key

Data Table 1: Plant Growth Comparison Over Time (Trial 1)				
	Plant 1		Plant 2	
End of Each Week	Amount of Water (mL)	Growth (mm)	Amount of Water (mL)	Growth (mm)
1	20	20	40	20
2	20	21	40	29

Skills Practice: Line Graphs

Digital Student Journal Slides 22-23

Description: Students use their prior knowledge of line graphs to label the axes. They select the correct data set using the line graph.

Scientific & Engineering Practices Spotlight

5.1F Construct appropriate graphic organizers used to collect data, including tables, bar graphs, line graphs, tree maps, concept maps, Venn diagrams, flow charts or sequence maps, and input-output tables that show cause and effect.

- Students practice constructing a line graph using ordered pairs.

Math Spotlight

5.8C Graph in the first quadrant of the coordinate plane ordered pairs of numbers arising from mathematical and real-world problems, including those generated by number patterns or found in an input-output table.

- Students practice constructing a line graph using ordered pairs.

If students struggle to distinguish between the two types of variables and which axis they are on, use the following reference, DRY MIX:

DRY - Dependent, Responding variable on Y-axis, and
MIX - Manipulated Independent variable on X-axis.

Slide 22, Answer Key

1.

X	Time (days)
Y	Plant Height (mm)

2. Set A corresponds to the line graph

A	X	1	3	5
	Y	20	40	65

Slide 23, Answer Key

3. Set C corresponds to the line graph

C	X	1	2	3	4	5
	Y	30	52	60	80	90

Investigation: Collect Data

Digital Student Journal Slide 24

Description: Students collect data based on the practice they have previously completed.

When reviewing the data table with students, point out that data was collected from both the living (biotic) and nonliving (abiotic) components of the ecosystem. This method connects the data collection back to the central concept that organisms interact with other living and nonliving parts of the ecosystem. Data was collected on the amount of water and sunlight, the nonliving factors, and the amount of plant growth, the living factor, of the ecosystem.

Answer Key

Data Table 1: Plant Growth Comparison Over Time (Trial 1)						
	Plant 1		Plant 2		Plant 3	
End of Each Week	Amount of Water (mL)	Growth (mm)	Amount of Water (mL)	Growth (mm)	Amount of Water (mL)	Growth (mm)
1	20	20	40	20	0	0
2	20	21	40	29	0	0
3	20	26	40	41	0	0
4	20	30	40	52	0	0
5	20	35	40	60	0	0

Investigation: Graph Data

Digital Student Journal Slide 25

Description: Students plot data from a table into a line graph for three plants. They match the correct set of data to the graph.

Scientific & Engineering Practices Spotlight

5.2E Construct appropriate simple graphs, tables, maps, and charts using technology, including computers, to organize, examine, and evaluate information.

- Students plot data from their trial of the simulated experimental investigation.

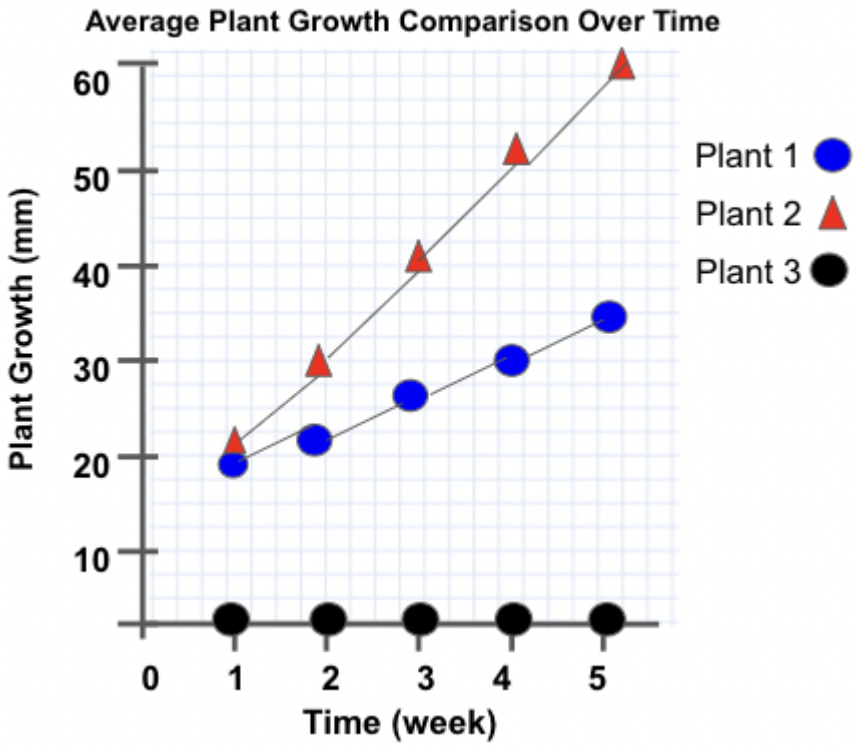
Math Spotlight

5.1D Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.

- Students translate data's meaning in a table to a line graph of changing variables over time.

The y-axis represents plant growth in millimeters. The x-axis represents time in weeks. The amount of water and sunlight is different for each plant, which is reflected in each plant's line, respectively. Note this test does not reflect if there is causation, only if there is a correlation. We cannot say the reason plants grow is solely because of nonliving factors in the ecosystem; we can say that plant growth is affected by nonliving factors such as water and sunlight.

Answer Key
Pictured below.



Investigation: Analyze Data

Digital Student Journal Slide 26

Description: Students analyze data represented in graphic organizers.

Scientific & Engineering Practices Spotlight

5.2B Analyze data by identifying any significant features, patterns, or sources of error;

- Students record their first observations based on quantitative data organized in a graph. They may observe that plants receiving water and sunlight grow taller. Sources of error could include using different kinds of plants that have different tolerances for water vs. sunlight, not plotting data accurately on the graph, or using incorrect units of measure.

Analyze and Interpret Data: As students transition to the next point of the 3D learning trail in Practice A, they move from conducting an investigation to analyzing and interpreting the results..

- Analyze data.
- Identify significant features, patterns or sources of error.
- Use mathematical calculations.
- Identify advantages and limitations of models.
- Evaluate experimental designs.

Recall the rate of growth cannot be implied by the graph generated from the data collected in this model investigation. Only length can be inferred from this data. There is no correlation to plants growing faster with more water, just taller.

Answer Key

Student answers may vary, but anticipated responses should include a general observation that one plant grew more than another.

1. Plant 2. It received more water than Plant 1.

Investigation: Interpret Data

Digital Student Journal Slide 27

Description: Students interpret their empirical data to answer questions.

Answer Key

1. No, they would not go as high and they would be flatter.
2. Plant 3's growth would be less than both of the other plants. It would probably be pretty flat and wouldn't go very high (tall).

Investigation: Conclusion

Digital Student Journal Slide 28

Description: Students use evidence from their experiment to help answer the research question.

Scientific & Engineering Practices Spotlight

5.3B Communicate explanations and solutions individually and collaboratively in a variety of settings and formats.

- In addition to answering if there is enough data to support the hypothesis, students answer a research question on the cause-and-effect relationship of water and plant growth. They used empirical data collected, then analyzed it in a line graph. Finally, they interpreted data and how the results help answer the research question.

Recurring Themes & Concepts Spotlight

5.5B Identify and investigate cause-and-effect relationships to explain scientific phenomena or analyze problems.

- Students measure the results of plant growth with varying amounts of water and answer a research question on the cause-and-effect relationship of nonliving factors on living factors in a system.

A conclusion is an answer to the research question, not an explanation of the phenomena. The opportunity to write a conclusion is provided in this segment to help answer the research question regardless of the type of investigation conducted. It is intended to complete the scientific practice of experimentation prior to constructing an explanation in the following activity.

Recall a hypothesis is not a value statement; there is no such thing as a right or wrong hypothesis. A hypothesis is either supported or not supported by data. A hypothesis that is not supported by data is equally helpful in research as we can determine a logical conclusion to the research question.

Answer Key

In the investigation the biotic factor, the plant, was dependent on the water, which is the abiotic factor. During weeks 2, 3 and 5, the plant received at least 10 mL of water and the result was plant growth. In week 4, the plant received less than 10 mL of water and the result was no plant growth. The plant's growth is dependent on the amount of water, the abiotic factor. Organisms rely on plants, or the living things in environments, and also need abiotic things like water to grow.

When the plant received more than 10 mL of water, there was growth. In weeks when the plant did not receive more than 10 mL of water, there was no growth. There was enough data to support the hypothesis that plants which receive enough water will grow more than those that do not.

Investigation: Explanation

Digital Student Journal Slide 29

Description: Students construct an explanation based on investigation and the scientific principles. The explanation reflects the claim-evidence-reasoning model. The prompt for claim is directly aligned to the content standard. Students use evidence from their investigation and identify appropriate reasoning. All students complete this section even if they completed their own investigation using the *Custom Investigation Handout.*

The prompt for the claim, "How do organisms survive in healthy ecosystems?" applies knowledge from the investigation to the content standard, or how organisms survive in healthy ecosystems.

Scientific & Engineering Practices Spotlight

5.3A Develop explanations and propose solutions supported by data and models.

- Students use a prompt to write a claim, provide evidence, and identify reasoning to complete a scientific explanation.

5.3C Engage respectfully in scientific discussion.

- Mirroring the process of peer-review in the scientific community, the Claim-Evidence-Reasoning activity engages students in discussion with their own explanations. This is an opportunity for students to learn and participate in supportive discourse when sharing their ideas and promoting rich-discourse among all other students' ideas. Be sure to provide norms for respectful, accountable, and on-topic discussion.

Develop and Communicate Explanations and Findings: As students transition to the final point of the 3D learning trail for Practice A, they complete explanations.

- Claim-Evidence-Reasoning model
- Communicate explanations in a variety of settings and formats
- Listen to others' explanations
- Engage in respectful scientific discussion

Before beginning a whole-class discussion, be sure to bring all students back together, especially if some complete their own investigation using the *Custom Investigation Handout.* After regrouping, develop new small groups to differentiate discussion by mixed ability and language knowledge level. Consider using strategies such as a Think-Pair-Share, gallery walk, random partner/reader, or other collaborative learning activity to engage students as active communicators.

To help students share their explanations, refer to this model explanation of healthy ecosystems:

An ecosystem is a natural system of living and nonliving parts interacting when energy from the Sun is input into the system. All organisms interact in an ecosystem, and not just with each other. All organisms interact with the living and nonliving parts of the ecosystem, such as animals breathing oxygen that plants produce and plants using the carbon dioxide that animals produce. Systems are stable when all its parts keep interacting. In a healthy ecosystem, a variety of organisms interact with biotic (living) and abiotic (nonliving) parts to survive.

Answer Key

> Claim: Organisms rely on abiotic factors in ecosystems, like oxygen and water. If the system is unhealthy, it affects the biotic and abiotic factors and organisms.
>
> Evidence: Plants rely on water for growth, animals rely on plants to live and breathe.
>
> Reasoning: A. Organisms interact with both living (biotic) and nonliving (abiotic) factors in ecosystems.

Investigation: Evaluation

Digital Student Journal Slide 30

Description: Students reflect on the methods they used in the investigation. They also reflect on the Recurring Theme & Concept of system models and cause-and-effect relationships.

Answer Key

> Student answers will vary but anticipated student responses should reflect on how changing variables could result in uncertainty in the cause of the result. Correlation is not causation. There may be measurement errors, or more trials are needed. They were able to measure changes to a responding variable when the independent variable is changed, which is an aspect of cause-and-effect relationships of plant growth and water.

What Happened?

Digital Student Journal Slides 31-32

Description: Students build understanding of disciplinary knowledge and skills as they make observations anchored in phenomena, plan and conduct investigations, collect, analyze and interpret data, and develop and communicate explanations and findings relative to the phenomenon.

Recurring Themes & Concepts Spotlight

5.5B Identify and investigate cause-and-effect relationships to explain scientific phenomena or analyze problems.

- Students connect the cause-and-effect relationship of water and plant growth based on the data collected, analyzed, and interpreted.

Students connect the cabbage plant's ability to store water on its leaves to funnel to its roots in a self-watering process.

Slide 32, Answer Key

> Student answers may vary but anticipated student responses should include connections between the growth measured in the investigation to the water collected by plants in the cabbage family. They may connect that the plant gets the water to its roots and grows as a result.

Pulling It Together

Digital Student Journal Slides 33-34

Description: Students apply what they have learned to the new STAAR® question types.

Here are some additional tips for administering accessible formative assessments.

Assessments Accessibility Recommendations

Oral Administration:

- Preparation: For students who require more personalized assistance, consider offering oral administration of the assessment. Prior to the assessment, identify the students who will benefit from this accommodation.
- Quiet Environment: Ensure the testing environment is quiet and free from distractions to facilitate a comfortable setting for oral administration.

- Read Aloud: Sit with the student individually or in a small group and read the assessment questions and answer choices aloud. Remain neutral in tone and pace to provide consistency across all students.
- Clarifications: Be prepared to provide clarifications or rephrase questions if students request further explanation. Avoid giving away answers but offer support in understanding the content.

Transcribing for Student Access:

- Identify Needs: Identify the students who will require transcription support through the dictation tool. These are students who have difficulty typing and need their spoken responses transcribed.
- Designate a Scribe: Assign a scribe who can transcribe the student's spoken responses onto the digital platform. This could be the instructor, a teaching assistant, or a peer.
- Clear Communication: Ensure that the scribe understands the importance of accurately transcribing the student's responses without altering their meaning.
- Review with Student: Once the assessment is transcribed, review the answers with the student to confirm accuracy and make any necessary corrections.

Using a Dictation Tool:

We recommend the use of the Microsoft Edge® browser for dictation.

- Identify Needs: For students who may have difficulty typing their responses, identify those who require transcribing of their answers.
- Implementation: Before the assessment begins, ensure that each student's computer is set up with the Microsoft Edge browser. Instruct the students to navigate to the assessment using the Edge browser.
- Opening the Dictation Tool: Once students are on the assessment page, direct them to the text box where they need to input their response. Instruct the students to press the Windows key and the H key simultaneously to open the dictation tool.
- Dictating Responses for Transcription: Students will see a microphone icon. Instruct them to click on the microphone icon to start dictating their response for transcription. Remind students to speak clearly and at a normal pace to ensure accurate transcription.
- Completing the Assessment: Once the response is transcribed and edited, students can proceed to the next question or task as usual. Provide support if any technical issues arise or if students encounter challenges during the process.

Slide 33, Answer Key

1. A. Water and B. Sunlight

Slide 34, Answer Key

2. Water. Students may choose shelter or food but explain to students that water is essential to all living things. Organisms may go days without shelter and food but not without water.

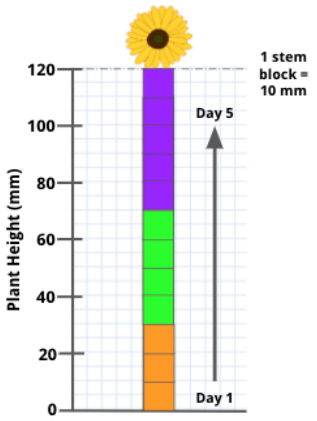
STEAM Extension: Art

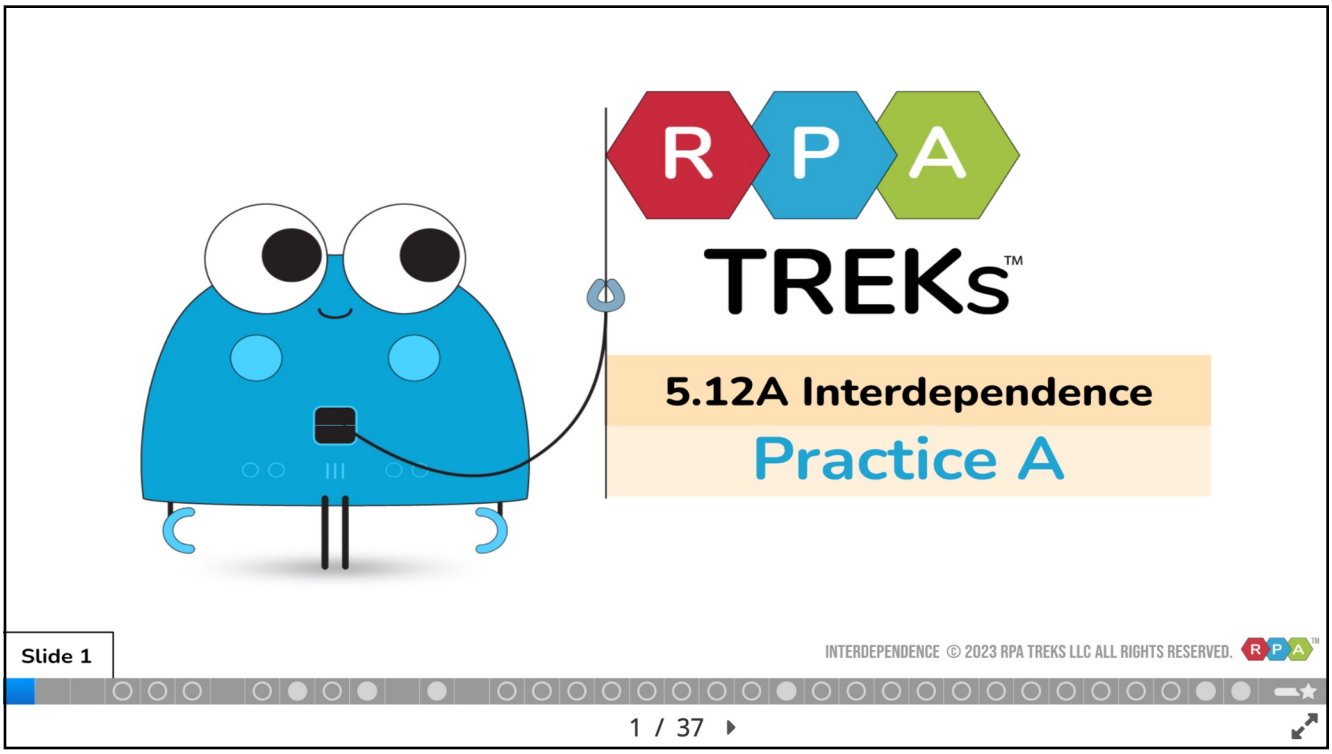
Digital Student Journal Slide 35

Description: This is an optional differentiated optional activity for non-linguistic representation of data. As some students complete the investigation, they may continue with this Extension.

Answer Key

Example key pictured below.




R P A
TREKs™
5.12A Interdependence
Practice A
Slide 1
INTERDEPENDENCE © 2023 RPA TREKS LLC ALL RIGHTS RESERVED.
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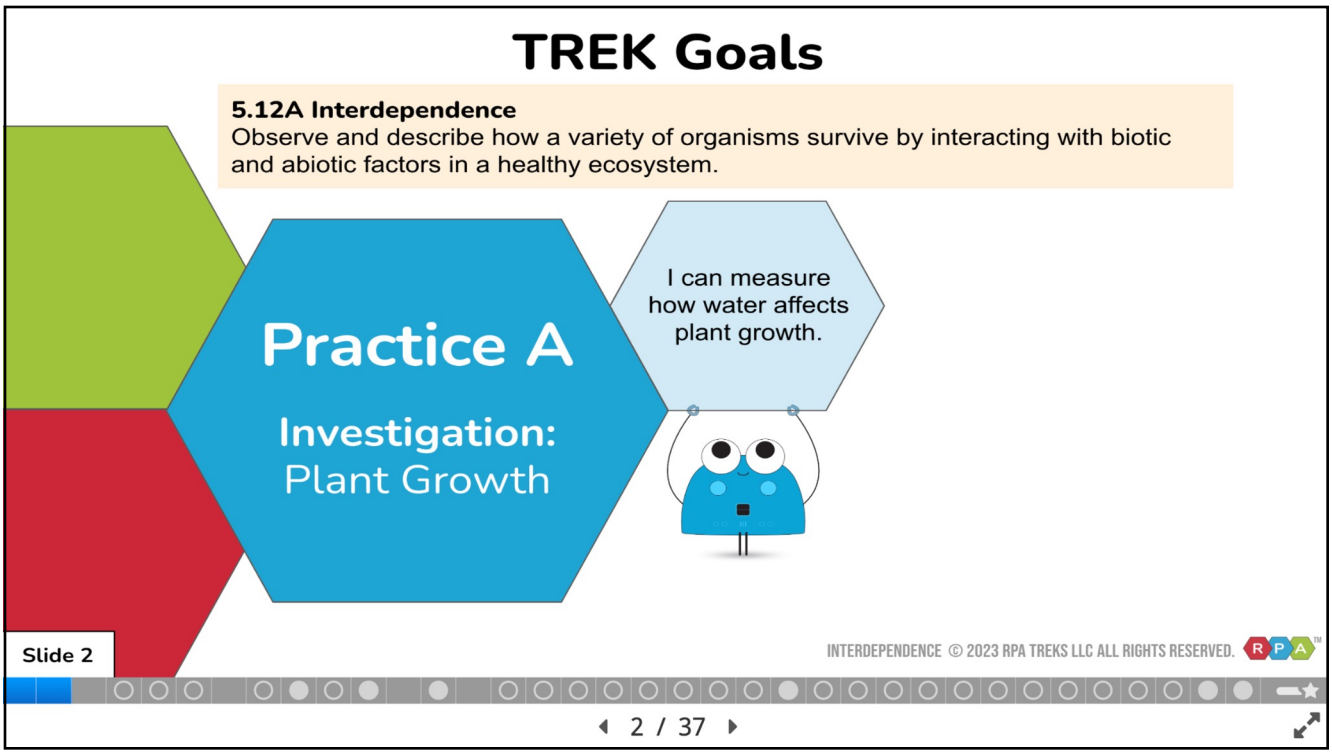
TREK Goals
5.12A Interdependence
Observe and describe how a variety of organisms survive by interacting with biotic and abiotic factors in a healthy ecosystem.
Practice A
Investigation:
Plant Growth
I can measure how water affects plant growth.
Slide 2
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Integrating Concepts, Practices, and Themes

What You Learn

All organisms interact with living and nonliving things in healthy ecosystems.

How You Learn

- Ask Questions
- Collect Data in Data Tables
- Graph, Analyze, and Interpret Data
- Communicate Explanations

How You Think

- Cause-and-Effect Relationships
- System Models

Practice A

Slide 3

What Is Happening?

Observe Phenomena

Sometimes scientists learn concepts through ***phenomena***, or observable events.

Instructions: Observe this image. Record as many observations as you can.

WRITE HERE

Submit

Slide 4

Observe Patterns

Instructions: Now, take another, closer, look at this image. Use qualitative and quantitative terms as you describe patterns you notice.

WRITE HERE

Submit

Slide 5

5 / 37

Ask Questions

Instructions: Based on your observations, formulate questions about the image. What do you wonder?

WRITE HERE

Submit

Slide 6

6 / 37

PRACTICE A

Construct an Explanation

"Why is water present on the leaves of the plant?"

To answer this question, you'll develop and use a model to construct an explanation to represent what you think about the phenomenon. You may communicate this individually or collaboratively with your peers on a sheet of paper or chart paper.

1. Identifying the components of the system and their relationships to each other,
2. Using connections between the components to describe and predict,
3. Identifying a scientific cause.

Before identifying the components of the system, you need to review what a system is and how systems work. A system is closed set of components that interact with each other. For example, a computer is a system of hardware and software interacting as electricity is added to the system.

An ecosystem is a natural system of living and nonliving parts interacting when energy from the Sun is input into the system. All organisms interact in an ecosystem, but not just with each other. They interact with the living and nonliving parts of the ecosystem, such as animals breathing oxygen that plants produce and plants using the carbon dioxide that animals produce. Systems are stable when all its parts keep interacting. In a healthy ecosystem, a variety of organisms interact with biotic (living) and abiotic (nonliving) parts to survive.

Slide 7

PRACTICE A

Develop an Explanation

Driving Question: "Why is water present on the leaves of the plant?" **Instructions**: Complete the steps provided to develop an explanation of the phenomenon to address the driving question. You may use the *Develop an Explanation Handout* or blank paper. Communicate individually or collaboratively with your peers.

1A. System name:

1B. Identify the components of the system. Use a sketch to support your response.

1C. Identify and describe the relationship between the components.

Submit

2. Use the model to describe and make predictions about the phenomenon.

3. Identify and explain a scientific cause.

Submit

Slide 8

PRACTICE A

Determine How to Test the Model

You will plan and conduct an investigation to test your model that represents the *What Is Happening?* phenomenon. Investigations can be descriptive or experimental depending on if variables are being recorded or compared. **Instructions:** Read the investigation descriptions. Move the one to the yellow box that could most accurately help to investigate your ideas about the phenomenon.

Descriptive Investigation

Does not compare variables and involves the systematic measurement of a variety of qualitative and quantitative characteristics.

Example: Describing how different plants look as they grow.

Experimental Investigation

Compares variables to determine if a relationship exists between them as they change or are changed. A fair test helps identify the causes of change if possible.

Example: Measuring plant growth in the shade vs. direct sunlight.

Submit

Slide 9

PRACTICE A

Determine How to Test the Model

Causation is if one variable can cause another variable to change. You cannot say if the variable changed BECAUSE of the changed variable, but you can determine if there were effects to the change. You are about to test a cause and effect relationship based on our observations of phenomena. In this investigation, we will compare variables to see if there is a cause and effect relationship between them. Let's review the difference between cause and effect.

Instructions: List as many causes of plant growth as you can think of.

Cause Things that could make a plant grow.	**Effect** Results of the cause.
WRITE HERE	Plant Growth (mm)

Submit

Slide 10

PRACTICE A

Investigation: Plant Growth

read

You will plan and conduct an investigation on the variables involved with plant growth. You will measure, compare, and describe the amount of plant growth for the plants with different amounts of water over time.
Instructions: Move the variables of this investigation to the correct category.

RTC **Cause-and-Effect Relationships, Systems**

VARIABLES

Cause	Effect
The amount of water provided per day (mL)	The amount of plant growth (mm)
Abiotic factor	Biotic factor

At this point, you may conduct the investigation in this journal or plan and conduct your own investigation using the printed *Custom Investigation Handout* from your teacher.

Submit

Slide 11

PRACTICE A

Investigation: Plant Growth

read

Image Credit: Unsplash / Darren Richardson

SEP

Why are we studying this?

In a healthy ecosystem, a variety of organisms interact with biotic (living) and abiotic (nonliving) parts to survive. Water and sunlight are nonliving things that living things need, especially plants.

To understand how plants interact with abiotic factors like water in an ecosystem, you will measure how much they grow. Your experimental investigation is a 5-week simulation and multiple trials will be compared. You will observe and measure variables by watering plants and comparing their growth. You will analyze, graph, and interpret data to determine which plants grow when they receive enough water.

Your hypothesis is that plants which receive enough water will grow more than those that do not. To control the experiment, all plants will receive the same amount of simulated sunlight using a grow lamp.

Research Question: "How does water affect plant growth?"

Slide 12

PRACTICE A

Investigation: Plan

How will you investigate the Research Question: "How does water affect plant growth?" **Instructions:** Move the matching part of this **experimental investigation** to its term and definition.

Hypothesis A testable statement to investigate or test.	**Independent Variable** What is changed in an investigation to test.	**Dependent Variable** What changes as a result of the independent variable.	**Controls** Unchanged or separate to conduct a fair test.
B. The effect - how much the plant (biotic factor) grows each week.	A. The cause - the amount of water (abiotic factor) provided to plants.	C. Plants that receive enough water will grow more than those that don't.	D. A third plant is not watered to prove water is a growth mechanism.
PARTS OF THIS INVESTIGATION			

Submit

Slide 13

PRACTICE A

Investigation: Procedure

You will follow this procedure in the simulated experimental investigation:

1. Plant each seed in its own pot and add enough water to each pot so the soil is saturated.
2. Every day, add 20 mL of water to Plant 1, 40 mL of water to Plant 2, and no water to Plant 3.
3. At the end of each week, measure (in mm) the total height of each plant.
4. Subtract the current height of each plant from its height the week before to calculate how much each plant grew over that week.
5. Record the calculation in a data table.

Slide 14

PRACTICE A

Investigation: Materials & Tools

For this simulated classroom investigation, you will use the following materials and tools to observe, measure, test, and analyze information.
Instructions: Based on what you know about the research question and procedure, describe the purpose of each tool.

Materials
• 2 Seedlings, the same • 2 Pots • Enough soil to fill each pot with one seedling • Grow lamp • Water

Tools	Purpose: What will each measure and test?
Graduated cylinder	WRITE HERE Submit
Metric ruler	WRITE HERE Submit
 Hand lens or loupe	WRITE HERE Submit

Slide 15

PRACTICE A

Investigation: Lab & Field Safety

You will use safety practices and safety equipment in all classroom lab and field investigations.
Instructions: Select all the safety practices and equipment you will need use during this lab investigation.

Appropriate footwear	Dry and safe electrical outlets for equipment	Fire extinguisher nearby	Fire blanket nearby
Ensure proper ventilation	Transportation Plan	Repellant and allergy kit	Wear lab/field gloves
Do not enter chemical storage room	Handle glassware carefully to avoid breaking	Sunscreen, sun protection	First Aid kit nearby
Inform teacher immediately if items spill or are broken	Eyewash station nearby	Wear a lab coat/apron	Wear protective clothing
Wear safety goggles	Do not touch broken glass	Appropriate waste disposal can nearby	Paper towels to clean lab station
Do not pour chemicals down the drain	Individual water bottle	Pull back long hair, wear short sleeves, secure loose clothing or jewelry	Lamp is safely placed to not cause injury or fire

Submit

Slide 16

PRACTICE A

Investigation: Lab & Field Safety

A grow lamp will be used to control the amount of light needed for all plants to receive about the same amount of light. How will you safely do the following in your procedure? **Instructions:** Answer each question to describe how you will demonstrate safety as you complete this investigation.

Safety Practice	How will I demonstrate safety?
How will you place the lamp within the experiment area to avoid personal injury?	WRITE HERE Submit
How will you help make sure the lamp does not cause a fire?	WRITE HERE Submit

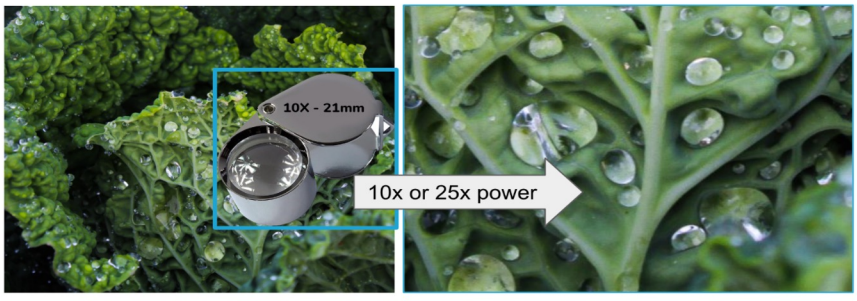
Slide 17

17 / 37

PRACTICE A

Skills Practice: Observations

In lab and field science, looking at objects up close results in even more observations, and often more questions. A hand lens, loup, or magnifying glass are all ways to make handheld close-up observations without having to use a microscope. Most are in powers of ten (10x), but sometimes you'll find 25x. What do you observe in the images when looking closer? **Instructions:** Record as many quantitative or qualitative observations of the close-up image as you can.



WRITE HERE

Submit

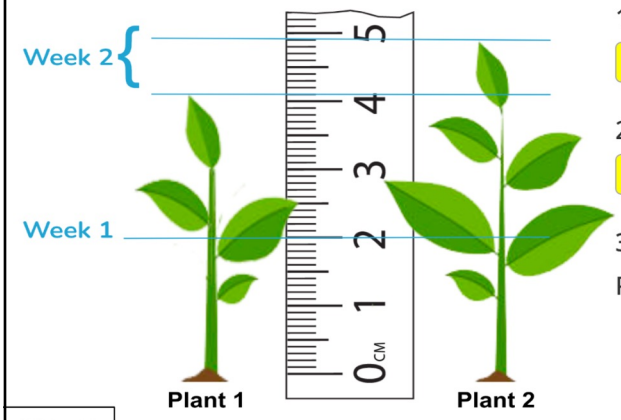
Slide 18

18 / 37

PRACTICE A

Skills Practice: Measure Height

Each plant is measured using a metric ruler. For every measurement, the ruler's 0 will be placed at the base of the plant. Then measure the height of plant at its top leaf. To calculate the each week's growth, subtract previously measured growth from the most current measurement. At the end of Week 1, both Plant 1 and Plant 2 have grown 20 mm, or 2.0 cm. **Instructions:** Answer the questions below, using the unit of measure of mm.



1. What was the height of Plant 1 at the end of Week 2?

2. How much did Plant 1 grow between Week 1 and Week 2?

3. What is the difference in heights between Plant 1 and Plant 2 at the end of Week 2?

Submit

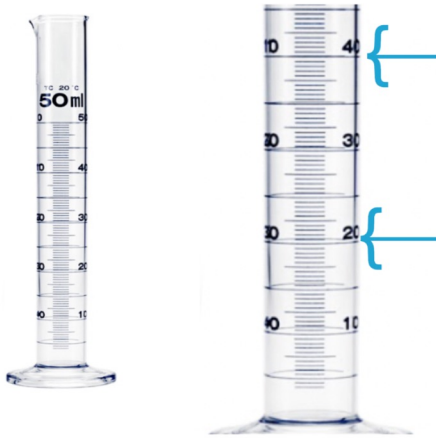
Slide 19

19 / 37

PRACTICE A

Skills Practice: Measure Volume

A common tool in labs is a graduated cylinder, which is used to measure volume. It's like a ruler for liquids, but instead of measuring in millimeters or centimeters, you use it to measure liquid volume in milliliters (mL) or cubic centimeters (cm^3). When measuring the amount of liquid, it's important to set the graduated cylinder on a stable table and read the marks at eye level. **Instructions:** Record the amount of liquid for each measurement, using the unit of measure mL.



Plant 2 will receive _____ of water each week.

Plant 1 will receive _____ of water each week.

Submit

Slide 20

20 / 37

PRACTICE A

Skills Practice: Collect Data

You will collect observations of a system and record data in a data table. Each week, you will observe and record the results of plant growth when water is added to the system. Each plant receives the same amount of light and does not need to be watered daily. You will measure the plant growth in millimeters (mm) on Fridays. Plant 1 will receive 20 mL of water each week. Plant 2 will receive 40 mL of water each week. **Instructions:** Practice collecting data for Week 1. Assume both plants start at 20 mm (2.0 cm) tall.

Data Table 1: Plant Growth Comparison Over Time (Trial 1)

	Plant 1		Plant 2	
End of Each Week	Amount of Water (mL)	Growth (Height in mm)	Amount of Water (mL)	Growth (Height in mm)
1				
2				

1. Write in the amount of water each plant gets for Week 1.
2. Measure the height of each plant each Friday. They both started at 20 mm (2.0 cm).
3. Write in the height of each plant. Remember 10 mm = 1 cm.

Submit

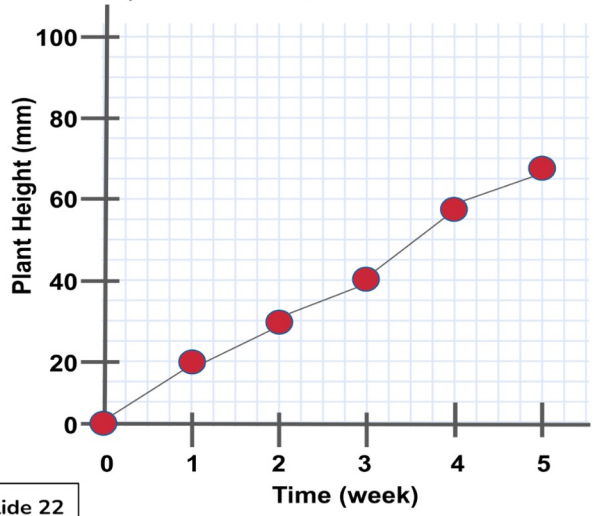
Plant 1 Plant 2

Slide 21

PRACTICE A

Skills Practice: Line Graphs

A graph exhibits data of variables as they change. It has an X-axis and a Y-axis. Points are plotted on the graph based on a pair of numbers, one for X and one for Y. Together, the pairs are called coordinates.



Instructions: Complete the activities below.

1. Write the label that corresponds to its matching axis.

X	
Y	

2.

A	X	1	3	5
	Y	20	40	65

B	X	20	40	65
	Y	1	3	5

Move your answer here:

Submit

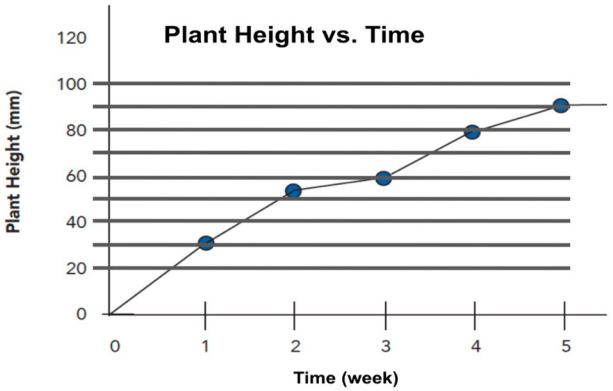
Slide 22

PRACTICE A

Skills Practice: Line Graphs

Instructions: Read and analyze the information below. Then, select the correct answer.

3. A student did an experiment and generated the graph below. Examine the possible data sets. Which data set best represents the graph?



A	X	1	2	3	4	5
	Y	5	5	10	35	40

B	X	0	2	4	6	8
	Y	30	52	60	80	90

C	X	1	2	3	4	5
	Y	30	52	60	80	90

D	X	1	2	3	4	5
	Y	25	47	52	65	95

Submit

Slide 23

PRACTICE A

Investigation: Collect Data

Collect observations and measurements as evidence to complete a data table. You will use a graduated cylinder to measure 20 mL water for Plant 1 each week and 40 mL water for Plant 2 each week. Plant 3 is not watered as a control.

Instructions: Follow the lab procedure to complete the data table for your trial.

Lab Procedure

1. Record the the amount of water Plant 1 and Plant 2 received each week. Plant 3 is a control and is not watered.
2. Measure the growth of each plant, or the height in mm each week. Since this is a simulation, these values have been recorded for you.

Data Table 1: Plant Growth Comparison Over Time (Trial 1)

	Plant 1		Plant 2		Plant 3	
End of Each Week	Amount of Water (mL)	Growth (mm)	Amount of Water (mL)	Growth (mm)	Amount of Water (mL)	Growth (mm)
1		20		20	0	0
2		21		29	0	0
3		26		41	0	0
4		30		52	0	0
5		35		60	0	0

Slide 24

PRACTICE A

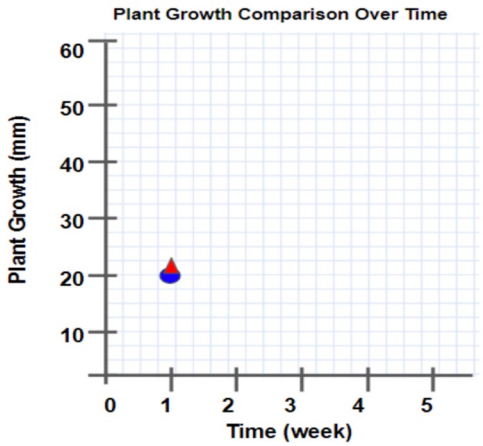
Investigation: Graph Data

Instructions: Use the Plant Growth data table to plot the Plant 1 blue circle data point along the y-axis of the graph for each week. Week 1 has been done for you. Repeat this for Plant 2 using the triangles.

Data Table 1: Plant Growth Comparison Over Time (Trial 1)			
	Plant 1	Plant 2	Plant 3
End of Each Week	Growth (mm)	Growth (mm)	Growth (mm)
1	20	20	0
2	21	29	0
3	26	41	0
4	30	52	0
5	35	60	0

Plant 1

Plant 2



Submit

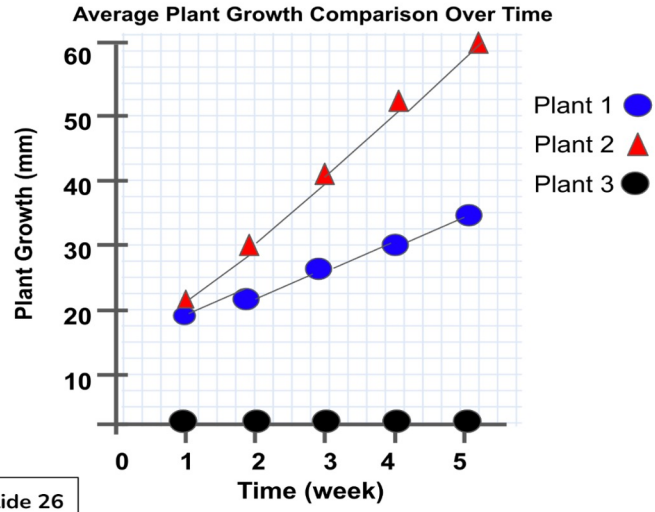
Slide 25

25 / 37

PRACTICE A

Investigation: Analyze Data

Each student had their own trial and the average results were compiled into one graph. **Instructions:** Review the completed graph of the data and answer the question below.



1. Analyze the data to identify any significant features, patterns, or sources of error.

WRITE HERE

Submit

2. In this investigation, the amount of water is an abiotic factor. The growth of plants are biotic factors. Even though both plants started at the same height, they did not grow the same. Which plant grew more and why?

WRITE HERE

Submit

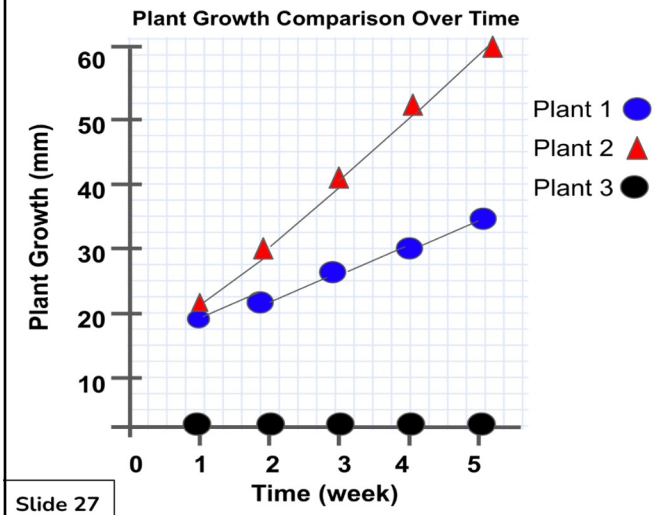
Slide 26

26 / 37

PRACTICE A

Investigation: Interpret Data

Like other scientists, you constructed a graph using data from observations collected in a table through a experimental investigation! Now let's interpret the data. **Instructions:** Answer the questions.



1. If both plants received 5 mL less water per week, would the growth rates be the same?

WRITE HERE

Submit

2. If there were more plants that received 10 mL of water each week, would their growth rate be more or less than the others? (Assume Plant 1 received 20 mL and Plant 2 received 40 mL.) How would their graph line be different than the others?

WRITE HERE

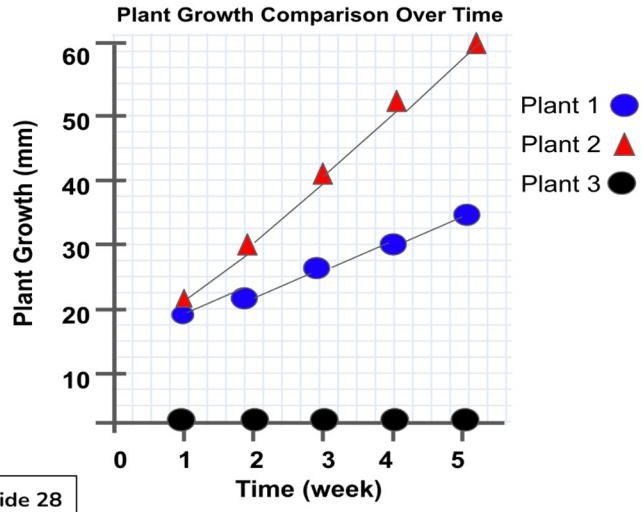
Submit

Slide 27

PRACTICE A

Investigation: Conclusion

Congratulations! You've now completed the experiment and analyzed the data! This system model helped you visualize the interdependence of biotic and abiotic factors in a healthy ecosystem, and plants need water!



Instructions: Review and answer the initial research question. For your conclusion, describe if there was enough data to support the hypothesis that if plants receive enough water, they will grow more than those that don't.

Research Question:
"How does water affect plant growth?"

WRITE HERE

Submit

Slide 28

PRACTICE A

Investigation: Claim & Evidence

Instructions: Based on the data you observed and recorded about how water affects plant growth, write in your Claim and the Evidence. Then, move the best Reasoning Description into the Reasoning box. You may discuss this with your peers and actively listen to each other as you share scientific explanations.

Claim How do organisms survive in healthy ecosystems?	WRITE HERE Submit
Evidence What evidence from the investigation supports your claim?	WRITE HERE Submit

Reasoning
How does the evidence support your Claim?

REASONING DESCRIPTIONS

A. Organisms interact with both living (biotic) and nonliving (abiotic) factors in ecosystems.

B. Organisms only interact with living things, like plants.

C. Organisms only interact with nonliving things, like water.

Submit

Slide 29

29 / 37

PRACTICE A

Investigation: Evaluation

Reflect on the design and results of this classroom investigation on a system model. Models like watering plants help us understand ecosystems with variables that we can observe and measure. They also help us understand and describe relationships as variables change in the model, like plant growth in response to the amount of water in an ecosystem. **Instructions:** Write your evaluation of the scientific and engineering practices and concepts like cause-and-effect relationships and system models you utilized in the yellow box below.

WRITE HERE

Submit

Slide 30

30 / 37

What Happened?

Instructions: How did this phenomenon support the development of your understanding of the cause-and-effect relationship between biotic and abiotic factors as evidenced in this system model?

WRITE HERE

Submit

Slide 31

What Happened?

These plants are self-watering!

Plants in the “cabbage family” include vegetables like broccoli, cauliflower, chard, bok choy, arugula, kale, radish, and - you got it - cabbage. All plants need water, but these plants need almost 3 liters of water a day! They get it by using their super-textured leaves to collect water droplets. The droplets slowly drain down to the plant’s roots instead of quickly evaporating or being splashed away. All plants need air and water, just like animals. Every time plants and animals breathe (yes, plants breathe too!), we are interacting with a system of nonliving things like air and water.

What other questions do you have about how plants grow?

WRITE HERE

Submit

Slide 32

PRACTICE A

Pulling It Together

Image Credit: Unsplash / Kiyoshi

1. In a healthy desert ecosystem, like the one shown in the photo, relatively few plant species can survive. Based on what you learned in this investigation, which abiotic factors are needed to support plant growth here?

Select **TWO** correct answers.

- [ ] Water
- [ ] Sunlight
- [ ] Rocks
- [ ] Insects

Submit

Slide 33

PRACTICE A

Pulling It Together

Image Credit: Unsplash / Benjamin Balázs

2. All living things rely on biotic and abiotic factors to survive in healthy ecosystems.

What is the one specific abiotic factor that every living thing on Earth needs? Enter your answer and explanation in the box provided.

Enter your answer in the box.

Submit

Slide 34

PRACTICE A

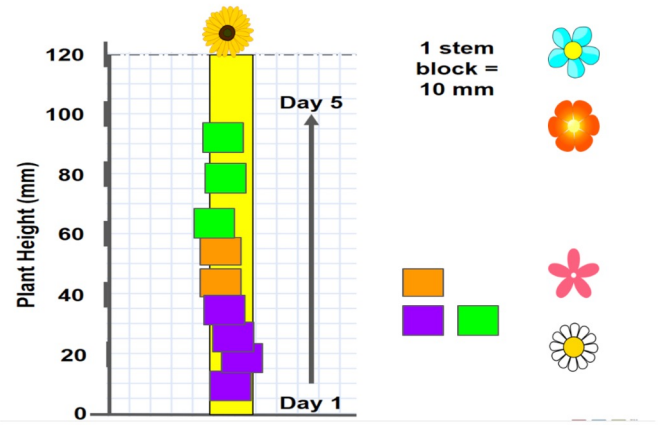
STEAM Extension: Art

Instructions: To show the plant's growth, build a plant with a stem and flower on the **VERTICAL BAR on the graph**. Use the pre-collected data from the experiment in the data table below.

Step 1: Move the plant stem blocks to stack up each day's correct stem growth (one color for each day). All blocks will be used.

Step 2: Choose a flower to top it off!

Time (day)	Growth (mm)
1	0
2	30
3	40
4	0
5	50



Submit

Slide 35

Practice B Teacher Instructions

In the Field: Billie the Birdwatcher

Objective: Each student will be able to identify habitats based on their biotic and abiotic components in healthy ecosystems.

- “I can identify how different bird species rely on their environment to survive.”
- Students actively read and reflect as field scientists, support a field investigation with Billie the Birdwatcher, and identify appropriate habitats for three North American bird species.
- Academic Terms: basic needs including habitat, shelter (space), food, water.

What Is Happening?

Digital Student Journal Slides 3-4

Description: Phenomenon-based approach for any classroom setting. This attention-getter can be used as either a cooperative learning strategy for engagement or as an individual reading opportunity to activate prior knowledge.

There is no correct or uniform answer for these connections. However, students should be able to relate information from 3rd, 4th, and possibly 5th grade to these terms using examples they have either directly observed or learned about previously. Be sure to provide time for students to make observations about the image before moving on to the description on previous slides. Encourage full sentences in the written descriptions.

In the Field: Billie the Birdwatcher Introduction

Digital Student Journal Slide 5

Description: Students help Billie with a descriptive field investigation on bird habitats most commonly found in eastern Texas. Students read field journal entries on various birds and identify where each bird lives, its shelter, and characteristics of their habitat to help answer the research question, “How do different birds live in different habitats?”

Scientific & Engineering Practices Spotlight

5.4B Research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field to investigate STEM careers.

- Students see how Billie's practice is similar to that of an ornithologist or terrestrial ecologist.

In the Field: Instructions

Digital Student Journal Slide 6

Description: Students are introduced to the featured character and also read their activity instructions.

In the Field: Observing

Digital Student Journal Slides 7-9

Description: Students read a passage about the American Robin, a Great Blue Heron, and an Eastern Meadowlark. They use information on each species to complete an ID Card for each bird, respectively.

If students struggle to identify basic needs, remind them that in Practice A it was determined that all organisms required both biotic and abiotic factors to survive in a healthy ecosystem. Students should identify the biotic and abiotic factors noted in the journal entries.

Slide 7 American Robin, Answer Key

- WHERE IT LIVES: in a tree in our backyard
- SHELTER/NEST: bowl-shaped nest
- FOOD and/or WATER: worms and insects, small ponds, birdbath

Slide 8 Great Blue Heron, Answer Key

- WHERE IT LIVES: trees in marshy areas
- SHELTER/NEST: platform-style nests
- FOOD and/or WATER: fish

Slide 9 Eastern Meadowlark, Answer Key

- WHERE IT LIVES: native grasslands, prairies, pastures, agricultural fields, open areas
- SHELTER/NEST: small depressions in the ground, constructs a cup nest
- FOOD and/or WATER: insects, including crickets, grasshoppers, caterpillars, and grubs. Seeds and wild fruits

ELPS Spotlight

STRATEGY: Collaborative Learning

Group Presentation: Students will work in pairs or small groups to observe and document facts about a bird, and use the describing words to classify the bird's habitat, shelter, and food in a multimedia presentation.

Materials:

- Field journals for each student
- Pictures of American Robin, Great Blue Heron, and Eastern Meadowlark
- Multimedia presentation tools (e.g. PowerPoint, Google Slides)

Instructions:

1. Divide students into small groups and assign each group one of the three birds: American Robin, Great Blue Heron, or Eastern Meadowlark.
2. Each group will read about their bird and use the describing words in the text to search for images and/or videos and develop a multimedia presentation to teach the class about their bird.**(Reading)**
3. As each group presents, the class will record field observations in their field journal and classify information by the bird's habitat, shelter, and food. **(Listening and Writing)**
4. After all groups have presented, lead a class discussion on how the different birds' habitats, shelters, and foods vary and classify the descriptors observed.**(Speaking)**

Sentence starters to help students classify information:

- *The habitat of the [bird name] is...*
- *The shelter of the [bird name] includes...*
- *The food of the [bird name] consists of...*
- *I noticed that the [bird name] tends to live in/with/eat...*
- *Based on our observations, we can classify the [bird name] as a bird that lives in/with/eats...*

Note: Encourage students to use the vocabulary and describing words from the text and images to classify the birds' habitats, shelters, and foods.

ELPS Tips for Beginning EB students:

- Simplify Language: Use simple language and avoid complex sentence structures when communicating with Beginning EBs. This can help them understand instructions and concepts more easily.
- Use Visual Aids: Use pictures to help Beginning EBs understand the characteristics of each bird's habitat, shelter, and food.
- Provide Vocabulary Support: Provide visual vocabulary support through labeled pictures or word walls to help Beginning EBss learn and retain new words.
- Provide Sentence Frames: Provide sentence frames for students to complete when discussing the bird's habitat, shelter, and food (e.g. "The [bird name] lives in _____.").

ELPS Tips for Intermediate and Advanced EB students:

- Use Multimodal Approaches: Use a variety of approaches to teaching, such as visual, auditory, and kinesthetic activities. This can help Intermediate EBss learn through different modes of communication and processing.
- Provide Scaffolding: Provide scaffolding through sentence starters or prompts to help Intermediate EBs develop their ideas and express themselves more clearly.
- Encourage Collaboration: Encourage Intermediate EBss to work in groups and pairs with fluent English speakers. This can help them practice their language skills and build confidence in speaking English.

Pulling It Together

Digital Student Journal Slides 10-13

Description: Students answer a variety of the new STAAR® question types. The part of this section involves a sorting activity relative to terms based on abiotic or biotic needs.

Encourage students to use the bird ID cards to complete the Pulling It Together slides.

Slide 10, Answer Key

1. “with their bill into the plant cover”

Slide 11, Answer Key

2. Red-winged Blackbird.

Slide 12, Answer Key

3. Tree, birdbath.

Slide 13, Answer Key

4. Pictured below.

HABITAT	Backyard		Marshy Area		Meadow	
BIRD SPECIES	American Robin		Great Blue Heron		Eastern Meadowlark	
BASIC NEEDS	Biotic	Abiotic	Biotic	Abiotic	Biotic	Abiotic
	worm tree	birdbath	fish frog	pond	grasshopper grub	ground fence post

In the Field: Reflection

Digital Student Journal Slide 14

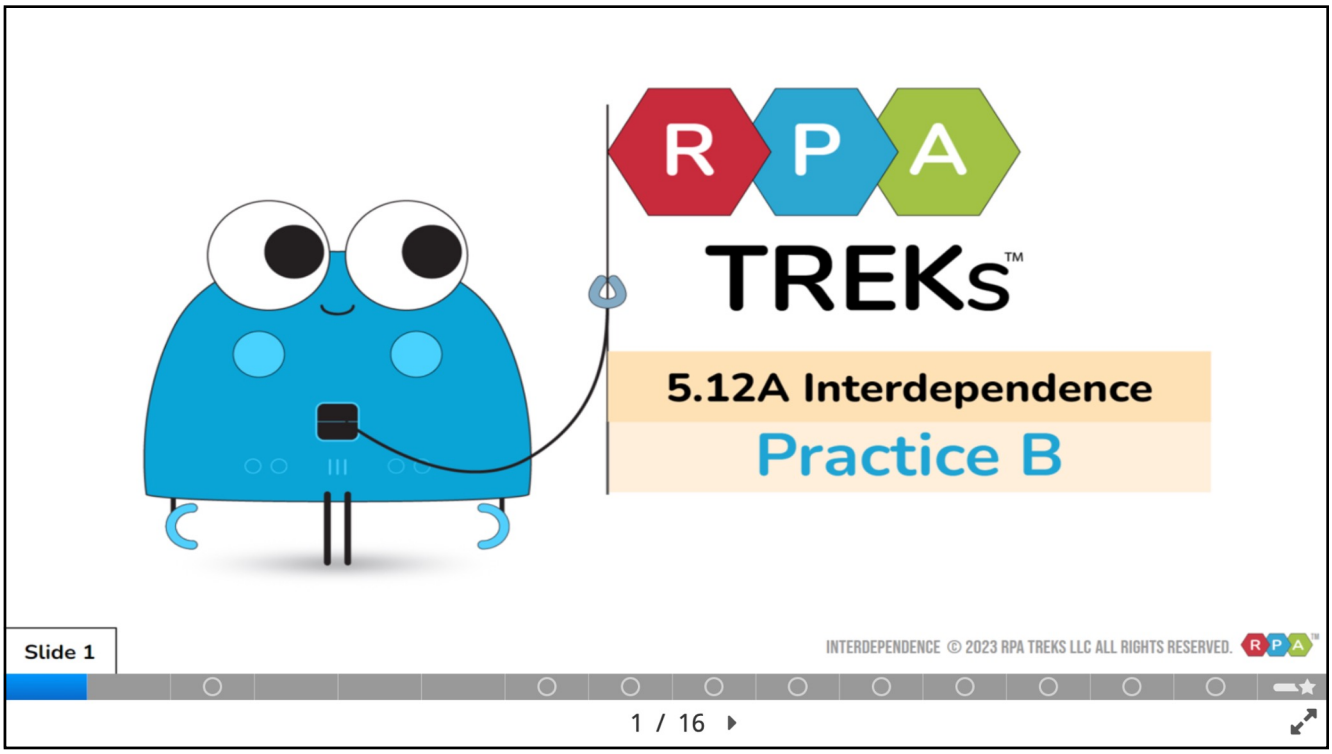
Description: Students reflect on the work they have done so far to make inferences based on their knowledge.

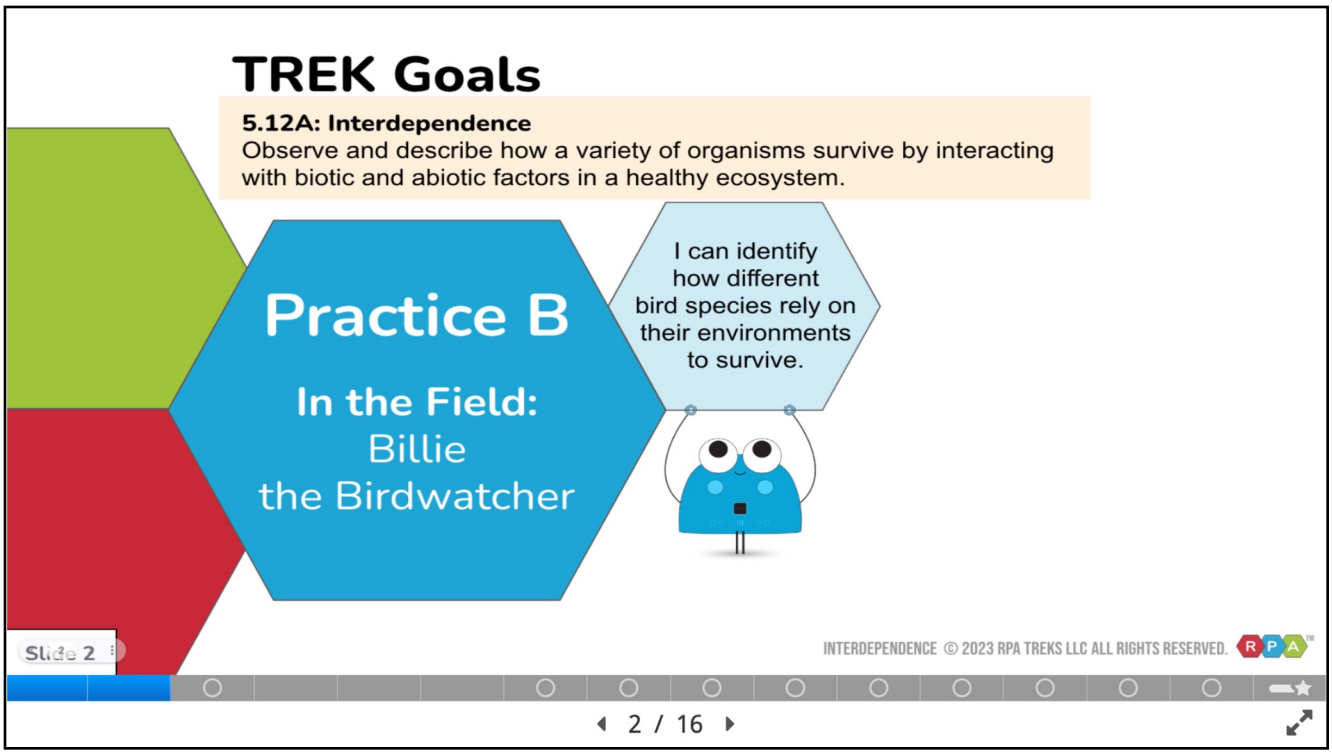
Encourage students to refer back to the previous Pulling it Together table when constructing their response.

Answer Key

Organisms must interact with biotic and abiotic factors to survive. Different birds need different biotic and abiotic factors in order to survive. The American Robin lives in backyards and basic biotic needs are worms and trees. Their abiotic needs are water in a birdbath. The Great Blue Heron lives in marshy areas and basic biotic needs are fish and frogs. Their abiotic needs are ponds. The Eastern Meadowlark can be found in meadows and basic biotic needs are grasshoppers and grub. Their abiotic needs are fence posts and the ground.

Student reflections will vary, but should generally focus on the patterns involved with studying how living things rely on abiotic factors in their environment to survive.


R P A
TREKs™
5.12A Interdependence
Practice B
Slide 1
INTERDEPENDENCE © 2023 RPA TREKS LLC ALL RIGHTS RESERVED.
1 / 16


TREK Goals
5.12A: Interdependence
Observe and describe how a variety of organisms survive by interacting with biotic and abiotic factors in a healthy ecosystem.
Practice B
In the Field:
Billie
the Birdwatcher
I can identify how different bird species rely on their environments to survive.
Slide 2
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2 / 16

What Is Happening?

Instructions: Describe what you think is happening in this picture. What do you see? What does it make you think of? What does this make you wonder?

WRITE HERE

Submit

Slide 3

3 / 16

What Is Happening?

Sometimes food is hard to swallow!

This bird, a Double-crested Cormorant, hunted down a huge fish for its meal. The photographer reported that it took the bird nearly 20 minutes to finally swallow it whole.

While some birds eat seeds and insects, others eat fish, crayfish, clams, and other larger animals. What a bird eats is most often found where it lives. Such a habitat best meets not only a species' food needs, but also their needs for shelter, water, and good places to raise their young.

Slide 3

4 / 16

PRACTICE B

In the Field: Billie the Birdwatcher

Image Credit: Unsplash / li Shanting

Hi, my name is Billie. My favorite hobby is watching birds. There are so many different kinds of birds! It's so cool how all birds live and how they act differently from each other.

I not only watch birds, but I also photograph them in the field. I record my observations and field notes in a Field Journal. I need help making a bird identification guide based on my research and field notes.

You're going to be my ornithology research assistant to help me create a bird field guide!

Help me answer, "How do different birds live in different habitats?"

Slide 5

5 / 16

PRACTICE B

In the Field: Instructions

Billie took a field trip to the Houston Audubon's Bolivar Flats Shorebird Sanctuary to conduct a field investigation on common bird species at four different locations. The sanctuary's trail goes through a few different kinds of healthy ecosystems. She recorded her observations and data on identification cards. Help Billie create an ID Card for each bird and answer the question, "How do different birds live in different habitats?"

Instructions to complete the Field Guide:

1. Read each Journal or Research entry card.

2. On the right side of each slide, complete the card by writing in your responses to identify each bird's interactions with biotic and abiotic factors as observed by Billie:

- where it lives,
- how it shelters/nests, and
- characteristics about its food and/or water.

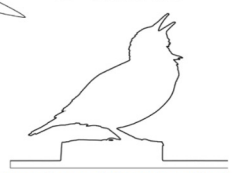
ID Card #1

American Robin
(*Turdus migratorius*)

ID Card #2

Great Blue Heron
(*Ardea herodias*)

ID Card #3



Eastern Meadowlark
(*Sturnella magna*)

Slide 6

6 / 16

PRACTICE B

In the Field: Observing

Instructions: Read the passage, then write in the description into its matching basics needs category in the ID Card.

Field Journal Entry: American Robin

I have been following the lives of a robin family that has a home in a tree in our backyard. Earlier this spring, the pair of adults built their nest on a tree shelf, where some large branches come together. The other branches above the nest seem to shelter the spot from heavy rains and predators, like hawks.

This shelter isn't enough to protect from cold. The parents made the nest by bringing small sticks and grass to the site in trips. They used the materials to create their bowl-shaped nest. Since then, four eggs hatched in the nest! When the chicks are hungry, they all chirp loudly. I've seen parents feed them different kinds of worms and insects.

The robins probably get water from the food they eat and from small pools after it rains. My mom also makes sure our birdbath is full of clean, fresh water. I have seen the robin bathe and drink from it.

ID Card #1

WHERE IT LIVES

WRITE HERE

Submit

SHELTER/NEST

WRITE HERE

Submit

FOOD and/or WATER

WRITE HERE

Submit

Slide 7

7 / 16

PRACTICE B

In the Field: Observing

Instructions: Read the passage, then write the description into its matching basic needs category in the ID Card.

Journal Entry: Great Blue Heron

The forest yields to a marshy area and a small pond with floating lily pads, along with the other aquatic plants and grasses. On the other side, I see a Great Blue Heron.

He is wading in the shallow water near some cattails. Maybe he is hunting. Looking for frogs? Bugs? He is stalking slowly, while his eyes survey the water. Suddenly, he thrusts his long neck thrusts downward. His beak sharply cutting into the water. He got it! He gulps down a small fish.

Another heron is nearby standing in a tree, on a large branch. Next to it is a platform-style nest, made mostly of sticks. It's about 2-3 meters across and a half meter deep. I can see some small bird beaks pointed up into the air. The hunter launches out of the water and up to his family. Back at the nest, he leans his head, passing food from his mouth into the mouth of each chick until he is unloaded his cargo. The chicks quiet down.

ID Card #2

WHERE IT LIVES

WRITE HERE

Submit

SHELTER/NEST

WRITE HERE

Submit

FOOD and/or WATER

WRITE HERE

Submit

Slide 8

8 / 16

PRACTICE B

In the Field: Researching

Instructions: Read the passage, then write the description into its matching basic needs category in the ID Card.

Research Entry: Eastern Meadowlark

A rain storm quickly cut short my field trip, and I returned home before scouting out a meadow. So, to learn more about the Eastern Meadowlark I would have observed in the field, I did some research at Cornell University's AllAboutBirds.org website. Here is a summary of what I found:

These birds are most common in grasslands, prairies, and other grassy areas. They can often be found singing on fence posts and telephone lines.

They get their food by walking on the ground and probing with their bill into the plant cover. They eat mostly insects, including crickets, grasshoppers, caterpillars, and grubs. During winter they also eat seeds and wild fruits.

The female finds a small depression on the ground - typically well-hidden by dense vegetation - and builds the nest over 4-8 days. She constructs a cup nest generally woven with dead grasses, plant stems, and strips of bark.

ID Card #3

WHERE IT LIVES

WRITE HERE

Submit

SHELTER/NEST

WRITE HERE

Submit

FOOD and/or WATER

WRITE HERE

Submit

Slide 9

9 / 16

PRACTICE B

Pulling It Together

1. Read the excerpt from the the Eastern Meadowlark card. Which words in this paragraph help the reader understand what probing means?

Select the correct answer.

"They get their food by walking on the ground and probing with their bill into the plant cover. They eat mostly insects, including crickets, grasshoppers, caterpillars, and grubs. During winter they also eat seeds and wild fruits."

Submit

Slide 10

10 / 16

PRACTICE B

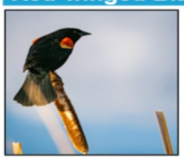
Pulling It Together

2. Read the question carefully. Then, enter your answer in the box provided.

Great Horned Owl

Nests in large holes called cavities in big trees, such as pine trees.

Red-winged Blackbird



Makes platform nests using coarse, wet plant material woven around large stems, like cattails.

Ruby-throated Hummingbird

Builds nests about 3-12 meters above the ground on a slender tree branch, like oak or poplar.

Greater Roadrunner

Nests about 3-10 meters above the ground on a horizontal branch or in the crotch of a sturdy bush, cactus, or small tree.

In the Field Journal, Billie recorded observations for the Great Blue Heron. Compare and contrast the heron's nesting description with those of the four other birds provided here.

Which bird is *most likely* going to nest near the Great Blue Heron? Support your answer with evidence from the descriptions.

WRITE HERE

Submit

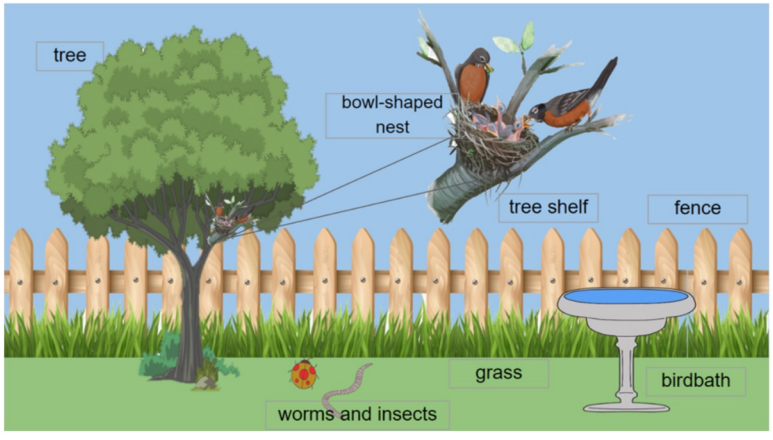
Slide 11

PRACTICE B

Pulling It Together

3. Observe the bird's interactions with biotic and abiotic factors in the image below. Which represent the basic needs of food and water for the bird?

Select **TWO** correct answers.



Submit

Slide 12

PRACTICE B

Pulling It Together

4. Move and sort the basic needs of different birds based on their habitat in a healthy ecosystem. Use all of the biotic and abiotic things listed in the Term Bank below.

HABITAT	Backyard		Marshy Area		Meadow	
BIRD SPECIES	American Robin		Great Blue Heron		Eastern Meadowlark	
BASIC NEEDS	Biotic	Abiotic	Biotic	Abiotic	Biotic	Abiotic

TERM BANK

fence post | birdbath | ground | pond | tree branch | fish | grasshopper | insect | worm | frog | grub

Submit

Slide 13

13 / 16

PRACTICE B

In the Field: Reflection

Instructions: Reflect on Billie's questions below, and write your response in the box.

Image Credit: Unsplash / li Shanting

Thanks for helping me complete my bird ID Cards! We found several patterns relative to how each bird interacts with biotic and abiotic things in its habitat. What did you learn about our research on how different birds live in different habitats?

WRITE HERE

Submit

Slide 14

14 / 16

Apply Teacher Instructions

Mission: The Great Turtle Rescue

Objective: Each student will be able to explain the necessary habitat needed for proper wildlife release locations using nonfiction text and maps.

- Students achieve the following 'I can' statement, "I can determine the best habitat to match the basic needs of a species."
- Students embark on a task-based mission for a wildlife release in a nearby wildlife refuge using habitat maps of Brazoria National Wildlife Refuge of coastal eastern Texas.
- Academic Terms: freshwater riparian forest, riparian zone, wetland, stream, brackish marsh, ocean, saltwater, freshwater, salinity, plantation.

What Is Happening?

Digital Student Journal Slides 3-4

Description: Students observe phenomena, or observable events, and record their observations. This discrepant event incorporates 3D learning of apparent motion, scientific and engineering practices, and recurring themes and concepts including patterns. It is an attention-getter that can be used as either a cooperative learning strategy for engagement or as an individual reading opportunity to activate prior knowledge.

There is no correct or uniform answer for these connections. However, students should be able to relate information from 3rd, 4th, and possibly 5th grade to these terms using examples they have either directly observed or learned about previously. Encourage full sentences in the written descriptions. When debriefing answers with students, have students recall the relationship between biotic and abiotic factors and have them identify those factors discussed on previous slides.

Mission: The Great Turtle Rescue

Digital Student Journal Slides 5-9

Description: Students are introduced to the scenario in a brief story about Tristan and Kyle. It includes related resources and instructions to complete their mission, which is to "Find the best release site for each turtle to understand why different turtles sometimes live in different habitats." They are provided secondary resources for Central Eastern Texas.

Scientific & Engineering Practices Spotlight

5.4B Research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field to investigate STEM careers.

- Students are introduced to a park ranger for a national wildlife refuge in Texas.

Students will learn terms (salinity, riparian forest, estuary, brackish marsh), practice interpreting a map of habitats, and read about turtle habitats, to complete their mission.

Apply Academic Terms

Digital Student Journal Slides 10-13

Description: Students move academic terms into sentence stems for explanations on salinity of bodies of water between freshwater and marine ecosystems.

Slide 10, Answer Key

- Salinity: The level at which water is *salty*.

Slide 11, Answer Key

- Freshwater Riparian Forest: Where a *wetland* area runs along the banks of a river or *stream*.

Slide 12, Answer Key

- Estuary: Where the mouth of a *freshwater* river flows into the saltwater *ocean*.

Slide 13, Answer Key

- Brackish Marsh: A marshy area often found near an *ocean* with water that is *salty* somewhere in between freshwater and the ocean.

Relative Salinity of Texas Water

Digital Student Journal Slide 14

Description: Students use the terms from the term bank and clues from the passage to place the terms in order from least to most salty.

Answer Key

From least to highest salinity: *Freshwater Stream, Brackish Marsh, Ocean*

Skills Practice: Interpreting a Map

Digital Student Journal Slide 15

Description: Students write a description of habitats based on the map, using the knowledge they have gained about freshwater and saltwater.

Answer Key

Sample Answer: A1 and C5 are similar because they are along water. They are different because of freshwater versus saltwater. A1 is a riparian area, C5 is along ocean water.

Research Turtle Facts

Digital Student Journal Slide 16

Description: Students read two entries about different turtles and their habitats and diets.

- Students recognize a wildlife refuge, like the Brazoria National Wildlife Refuge, is land set aside for open space and wildlife feeding/breeding.
- Students synthesize data to determine the best release sites based on freshwater vs. saltwater turtle biologies.
- Texas Diamondback Terrapins are the only turtles found where the salinity comes close to that of the ocean.
- Western Chicken Turtles live well in a mix of riparian habitat and hardwood forest. This habitat gives the turtle freshwater, shelter, and types of food specific to riparian areas.

Complete Your Mission

Digital Student Journal Slide 17

Description: Students choose the best location to release the turtles, based on information from reading the map and the information they have learned about each turtle species.

Answer Key

- **Western Chicken Turtle**: A1
  Prefers riparian areas around freshwater and near forests, but not pine plantations.
- **Texas Diamondback Terrapin**: C4
  Prefers living along marshes with high salinity.

Skills Practice: CER

Digital Student Journal Slide 18

Description: Using CER statements, students place the correct statement in each area.

If students struggle to distinguish between the Claim, Evidence and Reasoning, remind them that their Claim is what they know, their Evidence is how they know what they know, and their Reasoning is how what they know, supports what they know.

Answer Key

- **Claim**: B. A statement making a case or answering a question.
- **Evidence**: A. A fact or information that supports the Claim.
- **Reasoning**: C. An explanation using a scientific rule that describes why the evidence backs the Claim.

Mission: Conclusion

Digital Student Journal Slide 19

Description: Students answer the questions using the knowledge they have gained about habitats and turtles. They select a Reasoning Description to support their Claim.

Answer Key

- **Claim**: Sample Answer - Different organisms require different habitats. A freshwater turtle needs water without salt and a saltwater turtle needs water with salt.
- **Evidence**: Sample Answer - A key difference between the two turtles is the Western Chicken Turtle is not tolerant of salt & saltwater organisms so live in freshwater.
- **Reasoning**: B. Different turtle species use different kinds of living and nonliving things to satisfy their basic needs.

Pulling It Together

Digital Student Journal Slides 20-21

Description: A STAAR question type. Students use their understanding of biotic and abiotic factors to answer the questions.

Slide 20 Answer Key

1.

- **Part A**: D. The turtle eats shrimp and oysters.
- **Part B**: C. Living things are food for other living things.

Slide 21 Answer Key

2.

- Alligator in mangrove pond
- Heron approaching crabs to eat

Mission: Reflection

Digital Student Journal Slide 22

Description: Students write about what they have learned regarding habitats and the turtles' needs. Encourage students to refer to their Claim Evidence and Reasoning slide when completing the reflection.

Answer Key

Student answers will vary but should generally show understanding.

Organisms must interact with biotic and abiotic factors to survive but not all organisms need the same biotic and abiotic factors. Different turtle species rely on different kinds of water sources. The Texas Diamondback Terrapin Turtle can be found in brackish marshes where salinity is high. The Western Chicken Turtle can be found in freshwater. The abiotic needs for the two turtles are different. One needs salt water and the other needs freshwater.

ELPS Spotlight

STRATEGY: Structured Academic Talk

Q-Triple-S-A: Students will analyze the differences between turtle habitats by engaging in a Q Triple S A activity.

Instructions:
Question: Begin by posing an open-ended question or prompt related to the academic content being discussed.

- *Why do different turtles sometimes live in different habitats?*

Stem: Provide sentence stems to guide students with developing a response. Have students read each sentence stem out loud and think about how they will complete the sentence. **(Reading)**

- *Different turtles sometimes live in different habitats because . . .*
- *Supporting evidence includes . . .*
- *The evidence supports my claim because . . .*

Signal: Students use gestures or hand signals to indicate when they are ready to share their ideas (i.e. "*stand up when you have an answer*", or "*raise your hand when you have an answer*"). Observe wait time until students have all indicated that they have constructed an answer.

Share: Students take turns sharing their ideas and thoughts related to the question or prompt. **(Speaking and Listening)**

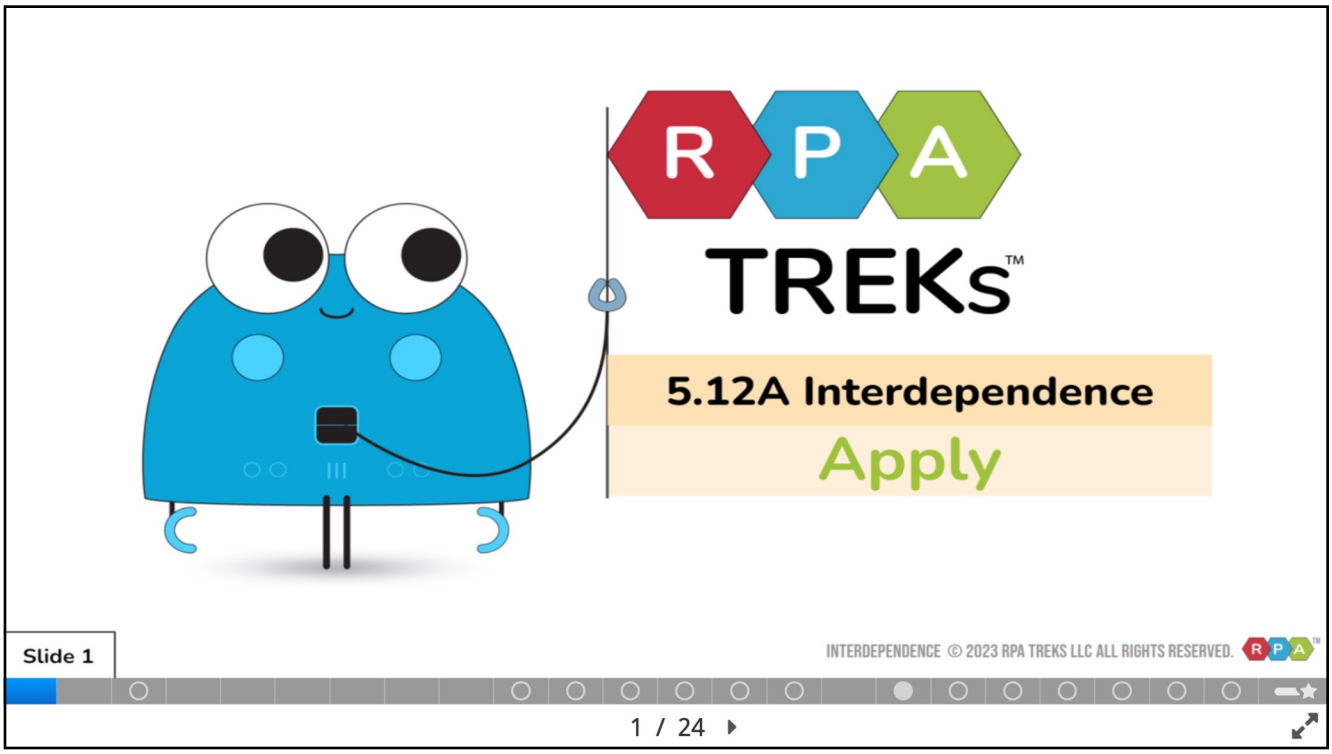
Assess: After the conversation, students reflect on their learning and assess their understanding of the content being discussed with two minutes to complete a written response to the original prompt. **(Writing)**

ELPS Tips for Beginning EB Students:

- Provide visual aids that include labeled diagrams and images
- Simplify sentence stems and using shorter sentence structures
- Offer translation or clarification in the students' primary language as needed
- Using hands-on manipulatives or props to demonstrate the relationship between mass and force

ELPS Tips for Intermediate and Advanced EB Students:

- Encourage collaborative group work to build language and social skills
- Provide sentence frames or scaffolds to support more complex sentence structures
- Use real-world examples that relate to the students' experiences and cultures


R P A
TREKs™
5.12A Interdependence
Apply
Slide 1
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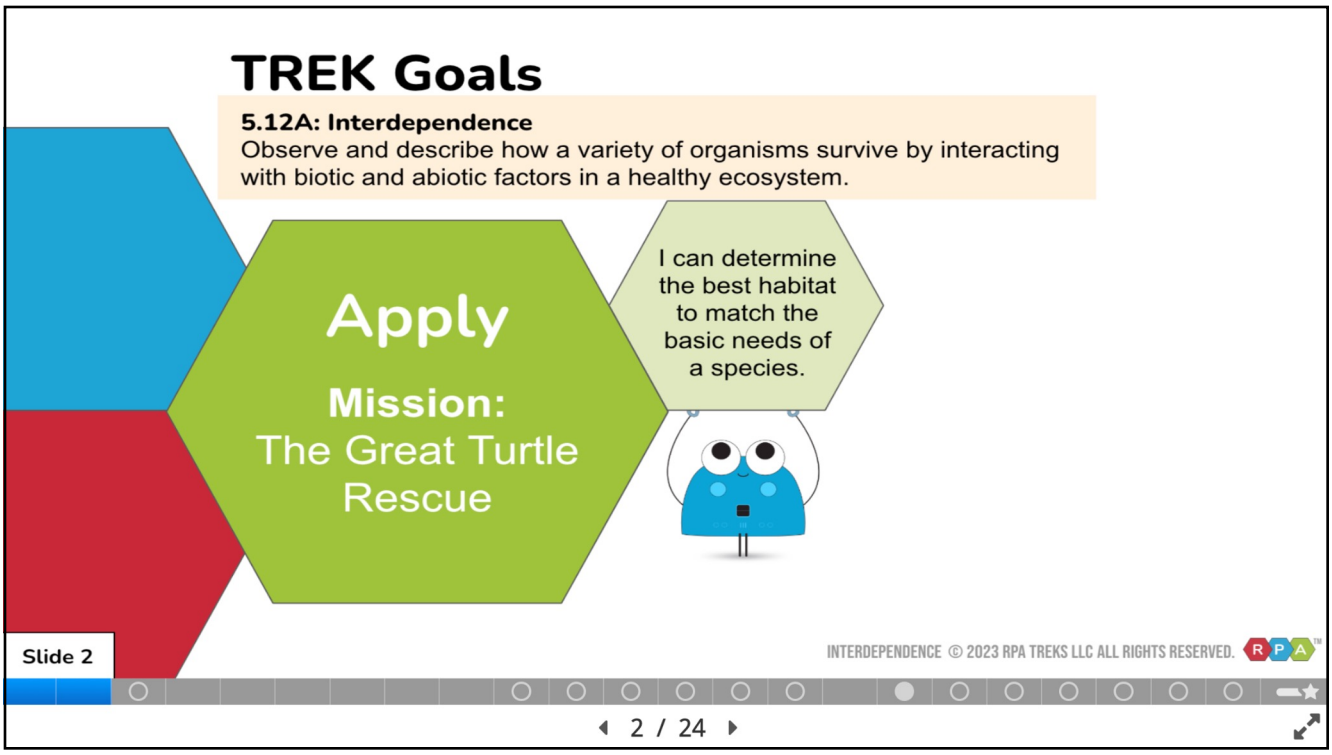
1 / 24


TREK Goals
5.12A: Interdependence
Observe and describe how a variety of organisms survive by interacting with biotic and abiotic factors in a healthy ecosystem.
Apply
Mission:
The Great Turtle Rescue
I can determine the best habitat to match the basic needs of a species.
Slide 2
INTERDEPENDENCE © 2023 RPA TREKS LLC ALL RIGHTS RESERVED.
2 / 24

What Is Happening?

Instructions: Describe what you think is happening in this picture. What do you see? What does it make you think of? What does this make you wonder?

WRITE HERE

Submit

Slide 3

3 / 24

What Is Happening?

Tree roots that thrive in saltwater!

Mangrove trees live along some of the world's marine coastlines. This includes the southeastern edge of Texas along the Gulf of Mexico.

These roots go through cycles of being underwater and being exposed to the air. This photo was taken at low tide, showing what mangrove tree roots look like. During average ocean levels and at high tide, the roots are underwater.

Mangrove trees are a key element for supporting these healthy ecosystems where saltwater ebbs and flows. These habitats provide some basic needs of many animal species here.

Slide 4

4 / 24

APPLY

Mission: The Great Turtle Rescue

Image Credit: Unsplash / Lia Trevarthen

You walk with your buddy, Tristan, into his house. In the kitchen is his teenage brother, Kyle. He is looking at something in a large cardboard box with no lid.

"What's in the box?" Tristan asks.

"Two turtles," replies his brother. "I'm going to throw them in the pot I've got boiling water on the stove. I hear turtle soup is really good, tastes like chicken..."

"WHAT?!" both you and your friend seem to yell at the same time. You peer into the box.

Kyle explains how he found these two turtles in the box, dumped off on the side of the road. Just looking at them, it is obvious that they are two different species.

Slide 5

5 / 24

APPLY

Mission: The Great Turtle Rescue

Western Chicken Turtle

Image Credit: Wikimedia Commons

Texas Diamondback Terrapin

Image Credit: Wikimedia Commons

"I can't release them back into the wild just anywhere," Kyle explains. "I've never seen these kind around here, so something else would probably just eat them anyway."

You and Tristan tell Kyle that you are pretty sure it's illegal to eat some turtle species in Texas. You and Tristan decide to track down what species they are and the best place to let them go. Kyle agrees.

You jump online and discover their identities. You also discover where they live and what they eat.

It's clear they came from two very different habitats. However, both habitats lie within coastal East Texas.

Slide 6

6 / 24

APPLY

Mission: The Great Turtle Rescue

read

YOUR MISSION:

Find the best release site for each turtle to understand why different turtles sometimes live in different habitats.

You and Tristan find a map online showing the major habitats in a large wildlife refuge nearby. You call the refuge office. Ranger Dawn answers the phone, and you tell her about your turtle rescue mission. She explains that when an animal is misplaced from its natural habitat, it may not survive. She says she can help release the turtles into new homes; the refuge manages a variety of healthy ecosystems and includes the right habitat for each species.

Ranger Dawn asks you to do the research yourself. She provides you with a few resources and suggests some questions to answer:

- What do the terms on the wildlife refuge map legend mean?
- How do those terms relate to how some habitats are saltier than others in this area?
- How does the map legend show these different habitats across the wildlife refuge?

To complete your mission, you will need to describe and justify your choices for her, explaining why you think each location makes a good new home for them.

Slide 7

APPLY

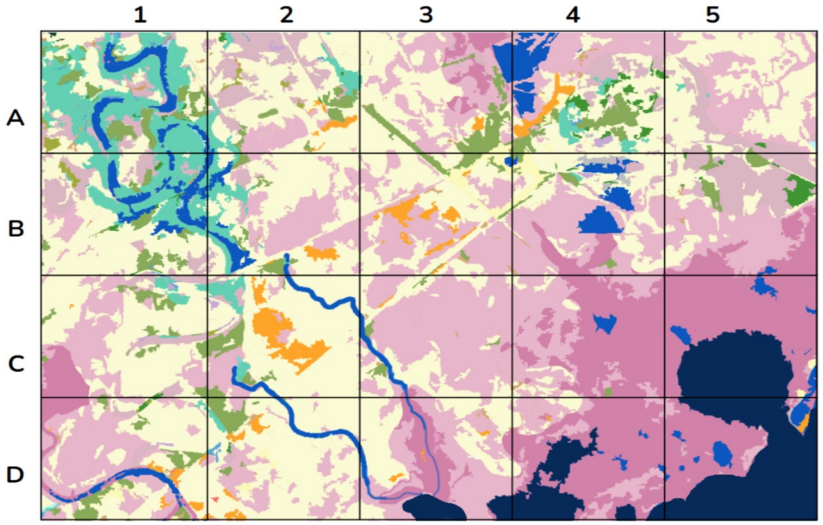
Resource: Wildlife Refuge Map

read

Ranger Dawn gave Tristan and Kyle this color-coded map of the wildlife refuge in Coastal Eastern Texas. You will be examining the habitats and think about where you might release each turtle.

- Human Development
- Fresh Water
- Ocean Water
- Freshwater Riparian Forest
- Pine Plantation
- Coastal Prairie
- Brackish marsh, high salinity
- Brackish marsh, low salinity

1 km



Slide 8

APPLY

Mission: The Great Turtle Rescue

The next series of slides of your research process will help you answer Ranger Dawn's questions:

1. **Learn Academic Terms**
   What do some of the key terms on the wildlife refuge map legend mean?

2. **Understand Relative Salinity of Texas Waters**
   How do those terms relate to how some habitats are saltier than others in this area?

3. **Practice interpreting the Wildlife Refuge Map**
   How does the map legend show these different habitats across the wildlife refuge?

To complete the mission, you will apply what you learned about the best habitat for each turtle to choose a map quadrant where each should be released.

Slide 9

9 / 24

APPLY

Academic Terms

Instructions: Using the Term Bank as a reference, write in the correct term in the sentence.

TERM BANK

salty

sandy

silty

rocky

Salinity

The level at which water is _____.

Submit

Slide 10

10 / 24

APPLY Academic Terms

Instructions: Using the Term Bank as a reference, write in the **TWO** correct terms in the sentence.

TERM BANK

tree | stream | wetland | sunlight | soil | living thing

Image Credit: Wikimedia Commons

Where a _____ area runs along the banks of a river or _____.

Submit

Slide 11

Slide 11

APPLY Academic Terms

Instructions: Using the Term Bank as a reference, write in the **TWO** correct terms in the sentence.

TERM BANK

fish | ocean | sunlight | soil | freshwater

Image Credit: Wikimedia Commons

Where the mouth of a _____ river flows into the saltwater _____.

Submit

Slide 12

Slide 12

APPLY Academic Terms

Instructions: Using the Term Bank as a reference, write in the **TWO** correct terms in the sentence.

TERM BANK

ocean | plants | shelter | mountain | salty | food | soil | estuary

Image Credit: Wikimedia Commons

A marshy area often found near an _____ with water that is _____ somewhere in between freshwater and the ocean.

Submit

Slide 13

APPLY Relative Salinity of Texas Waters

Instructions: Read the paragraph. Then using the Term Bank as a reference, write in the **THREE** correct terms to show their relative salinity on the scale.

Estuaries, Freshwater Riparian Forests, and Brackish Marsh habitats include water features with different salinity levels. Such waterways of Texas are part of the state's range of water salinity - from freshwater streams to the very salty ocean.

TERM BANK

Ocean | Freshwater Stream | Brackish Marsh

_____ _____ _____

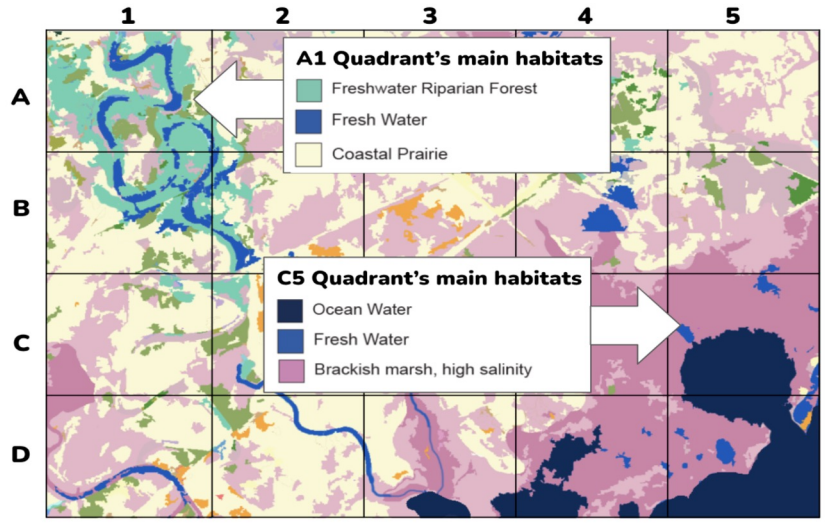
Least salty — SALINITY SCALE — Most salty

Image Credit: Wikimedia Commons / Bryan Rutherford

Slide 14

APPLY

Skills Practice: Interpreting a Map



Instructions: Look at quadrants A1 and C5 on this map.

Write a description of similarities and differences between the habitats in these quadrants.

WRITE HERE

Submit

Slide 15

15 / 24

APPLY

Research Turtle Facts

Instructions: Read the passages below. Each passage describes where each turtle lives and what it eats.

Texas Diamondback Terrapin

(Malaclemys terrapin)

HABITAT Brackish marshes and tidal creeks, where water salinity is high. These are the only turtles found where the water salinity comes close to that of the ocean. They balance their water needs by secreting salt from their tear glands.

Like other reptiles, these turtles regulate their body temperature using their environment. During the day, these terrapins spend their time in the water or basking in the sun. At night, they bury themselves in the mud, for both temperature balance and shelter from predators.

DIET Salt-loving crabs, shrimp, clams, oysters, fish, and aquatic insects.

Western Chicken Turtle

(Deirochelys reticularia)

HABITAT Riparian areas around freshwater within or near forests. The forests they prefer tend to have mixed species of hardwood trees, rather than pine forests or plantations.

The forest areas are important, because they provide cover for the turtles to move between wetland areas. They also rely on the forest, especially the leaf litter, for cover during the winter.

DIET Crayfish, fish, fruits, aquatic insects, frogs, tadpoles, and plants that need freshwater.

Slide 16

Slide 16

16 / 24

APPLY

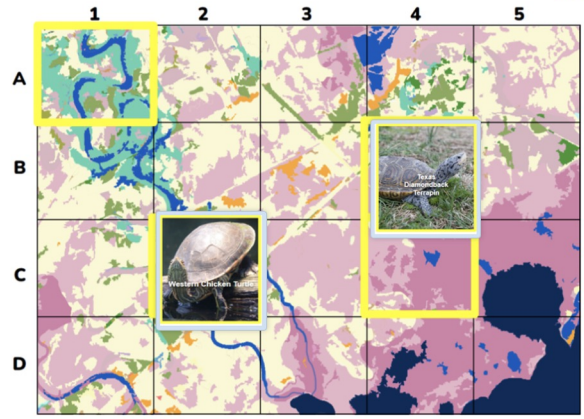
Complete Your Mission

Tristan and Kyle have narrowed down options to four possible sites. They are highlighted on the map.

Instructions: Move each turtle image below to one of the four quadrants outlined in yellow that includes the best habitat to release it.

- Human Development
- Fresh Water
- Ocean Water
- Freshwater Riparian Forest
- Pine Plantation
- Coastal Prairie
- Brackish marsh, high salinity
- Brackish marsh, low salinity

1 km



Submit

Slide 17

Slide 17

17 / 24

APPLY

Skills Practice: CER

Instructions: Identify the Claim, Evidence, and Reasoning (CER) statements for a scientific explanation. From the ***Parts of a CER*** area below, move each definition below its matching term.

Claim	Evidence	Reasoning

PARTS OF A CER

A. A fact or information that supports the Claim.

B. A statement or conclusion to answer a problem or question.

C. An explanation using a scientific rule that describes why the Evidence supports the Claim.

Submit

Slide 18

Slide 18

18 / 24

APPLY

Mission: Conclusion

Instructions: Based on your chosen release sites, write in your Claim and the Evidence. Then, move the best Reasoning Description into the Reasoning box.

Claim
Why do different turtles sometimes live in different habitats?

Submit

Evidence
What evidence from the Turtle Facts supports your Claim?

Submit

Reasoning
How does the evidence support your Claim?

REASONING DESCRIPTIONS

A. Different turtle species decide they like how a place smells.

B. Different turtle species use different kinds of living and nonliving things to satisfy their basic needs.

C. Different turtle species rely on different kinds of water sources in the same habitat.

Submit

Slide 19

19 / 24

APPLY

Pulling It Together

This question has two parts.
Think about what you have learned about the Texas Diamondback Terrapin.

Part A

Which of the statements below is an example of this turtle interacting with biotic factors in its environment?

- A. The turtle secretes salt from its tear glands.
- B. The turtle buries itself in mud at night.
- C. The turtle lies in the sun to get warm.
- D. The turtle eats shrimp and oysters.

Submit

Part B

Which statement supports the answer to Pa

- A. Shelter is always provided by living things.
- B. All living things need water.
- C. Living things are food for other living things.
- D. Sunlight helps all living things to grow.

Slide 20

APPLY

Pulling It Together

2. Which examples in the image demonstrate organisms surviving by interacting with biotic factors in this mangrove wetland ecosystem?

Select **TWO** correct answers.

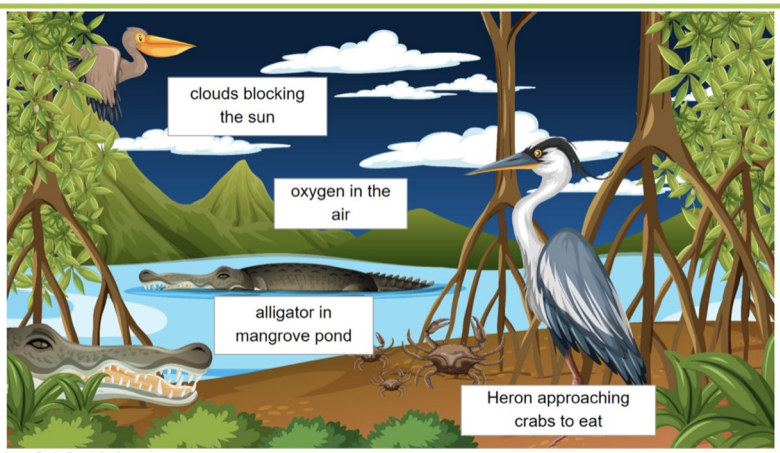


Image Credit: Freepix/brgfx

Submit

Slide 21

APPLY

Mission: Reflection

Instructions: Write your answer to the question below using complete sentences.

Why would you not release both turtle species in the same habitat?

WRITE HERE

Submit

Slide 22