RPA TREKs™

Versatile Lessons for Versatile Classrooms™

Unleashing the Curiosity of Scientific Thinkers Through Three-Dimensional (3D) Instruction

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NSTA Member Benefits

Journals — Full access all journals packed with classroom-tested activities

Lesson Plans — Free lesson plans featuring sensemaking tasks

Professional Learning — Professional learning and resources to further your professional journey

Conferences — Substantial discount on conference registration

NSTA Press books — 20% discount on NSTA Press Titles

E-newsletters — A subscription of our newsletters to keep up to date

Awards — Recognition from your peers of your accomplishments

Advocacy — NSTA advocates for science teachers at the national and state level

Leadership — Develop your skills while volunteering

Governance Revisioning

- Supports NSTA's Community initiative to "Recruit a diverse volunteer leadership pool."
- Started in quarter 1 of 2022
- Used interviews, surveys, townhalls, webinars, taskforces of members and current and former leaders of NSTA, chapters, and affiliated groups
- Proposes changes to Board and creation of new Leadership Council
- Bylaws are being drafted for a member vote in early 2024

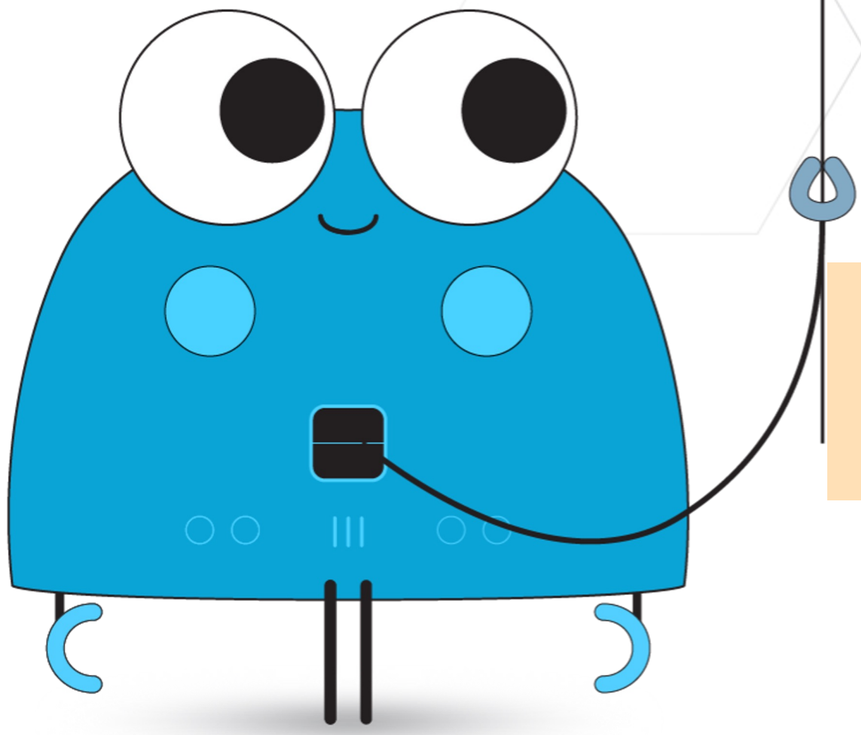
Purpose

- We will explore the impact of **3D learning** as Science classrooms shift to the new TEKS standards.

- Strategically and systematically integrate scientific and engineering practices (**SEPs**), recurring themes and concepts (**RTCs**), and grade-level **content** as outlined in the TEKS.

- **Anchor learning in phenomena and problems** as the key lever for driving learning and student mastery of disciplinary knowledge and skills.

The **Practice A** segment of each TREK moves students through a series of points along the 3D learning trial as they work to master content through the exploration of model investigations.



TREKs™

5.12A Interdependence

Practice A

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Integrating Concepts, Practices, and Themes

What You Learn

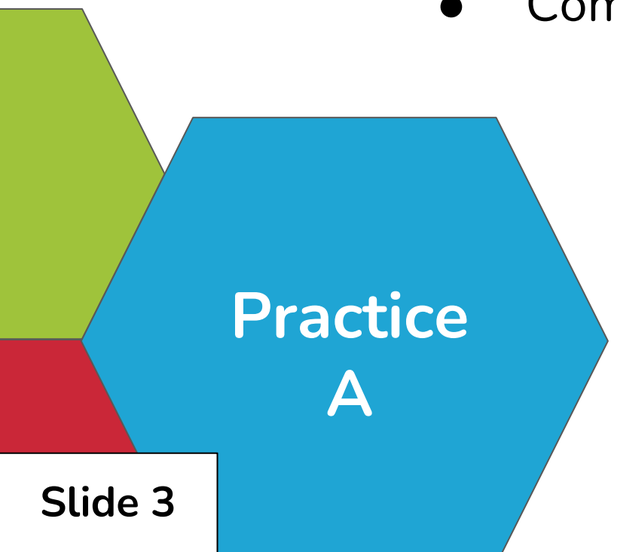
All organisms interact with living and nonliving things in healthy ecosystems.

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



Point 1: Anchor Learning in Phenomena (KS 5.1)

- Observe and/or read information about phenomena (SEP TEKS 5.1A)
- Find patterns (RTC TEKS 5.5A)
- Ask questions (SEP TEKS 5.1A)
- Construct explanations about phenomena (SEP TEKS 5.3A) using systems models (SEP TEKS 5.1G and RTC TEKS 5.5D) and/or mathematical calculations (SEP TEKS 5.2C)
  - Identify components of the system model
  - Use connections between parts of the system to describe and make predictions about the phenomena
  - Identify a scientific cause

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What Is Happening?

Image Credit: Unsplash / Kiona

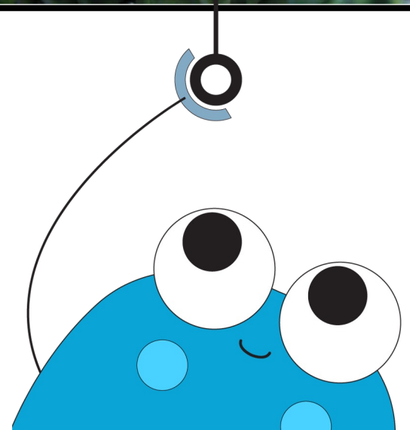
Observe Phenomena

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

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

WRITE HERE

Submit



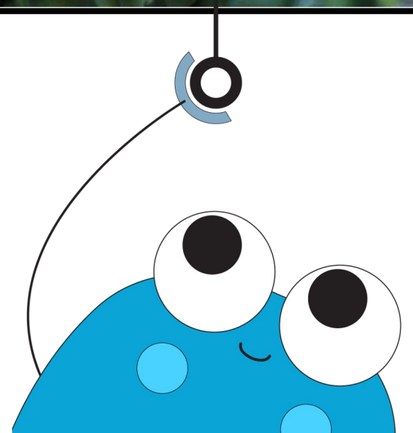
Observe Patterns

Image Credit: Unsplash / Kiona

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

WRITE HERE

Submit



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 a blank sheet of 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. Consider limitations and advantages of this model in your description.

3. Identify and describe a scientific cause.

Submit

Point 2: Plan and Conduct Investigations (KS 5.1)

- Determine how to test the model (SEP TEKS 5.1B)
- Establish the cause
- Identify variables
- Develop a procedure
- Identify tools and materials
- Demonstrate safe practices and use safety equipment (SEP TEKS 5.1C)
- Use tools to observe, measure, test and analyze information (SEP TEKS 5.1D)
- Collect evidence (SEP TEKS 5.1E)
- Construct organizers to collect data (SEP TEKS 5.1F)

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PRACTICE A

Determine How to Test the Model

You will plan and conduct an investigation to test your working model that represents the phenomenon. Investigations can be descriptive or experimental depending on if variables are being recorded vs. compared.
Instructions: Read the types of investigations and one which *could* investigate your ideas on the phenomenon.

Descriptive Investigation

Records variables but does not compare them. Describes characteristics qualitative and quantitative ways.

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

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.

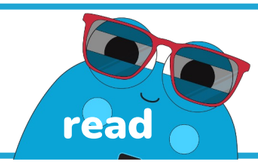
Instructions: List as many causes of plant growth as you can think of.

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

Submit

PRACTICE A

Investigation: Plant Growth



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 plants with different amounts of water over time.
Instructions: Move the variables that are observable for this type of investigation to the correct category.

RTC

Cause-and-Effect Relationships, Systems

VARIABLES

Biotic factor

Abiotic factor

The amount of water provided per day (mL)

The amount of plant growth (mm)

Cause	Effect

SEP

At this point, you may choose to:

- conduct the investigation in this Digital Student Journal or
- plan and conduct your own investigation using the printed *Custom Investigation Handout* from your teacher.

Submit

Point 3: Evaluate and Analyze Data (KS 5.2)

- Analyze data (SEP TEKS 5.2B)
  - Identify significant features, patterns or sources of error (RTC TEKS 5.5A)
  - Use mathematical calculations (SEP TEKS 5.2C)

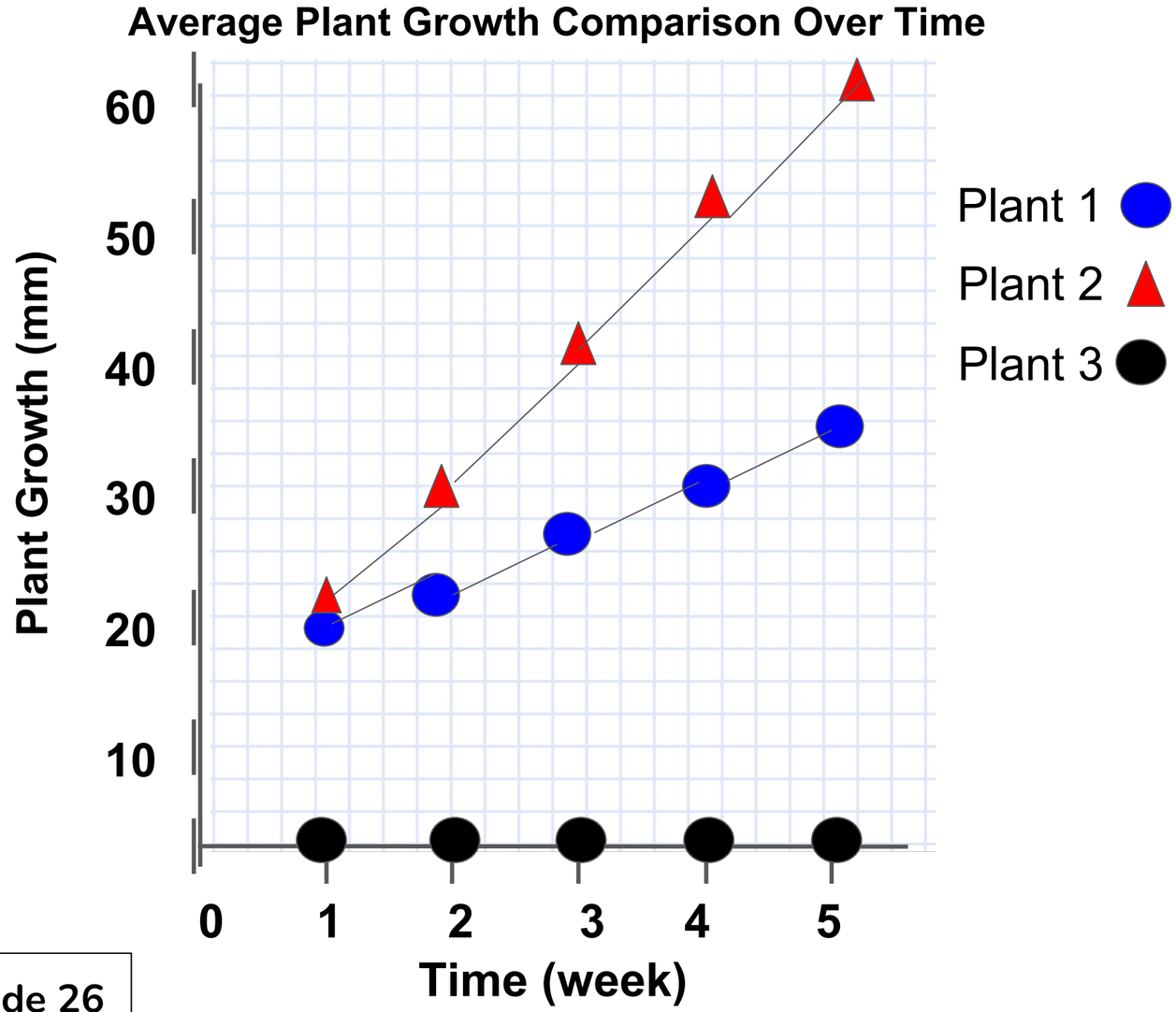
- Identify advantages and limitations of models (SEP TEKS 5.2A)

- Evaluate experimental designs (SEP TEKS 5.2D)

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

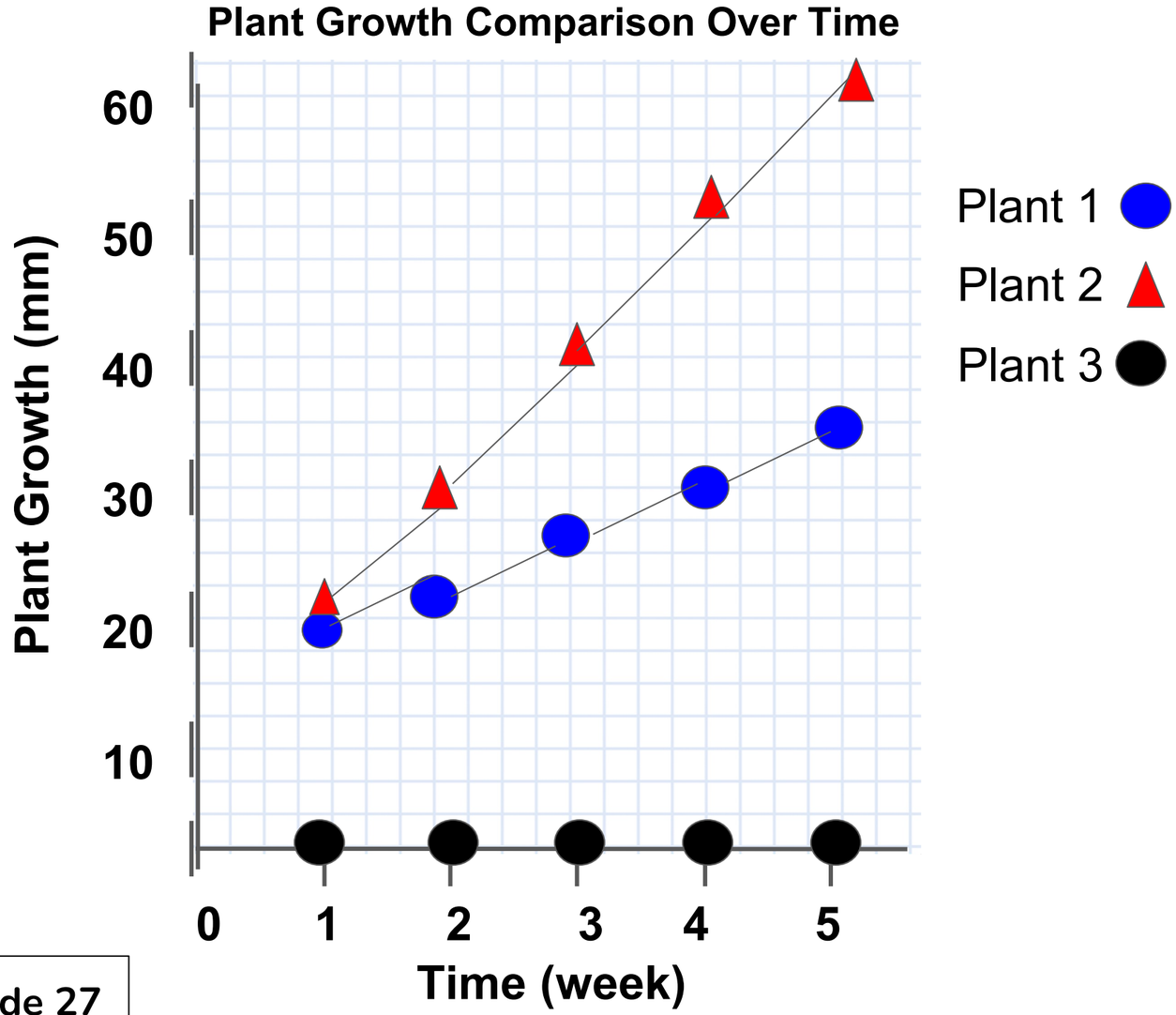
2. In this investigation, the amount of water is an abiotic factor. The growth of plants are biotic factors. Even though both plants started at the same height, they did not grow the same. Which plant grew more and why?

WRITE HERE

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

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 line be different than the others on the graph?

WRITE HERE

Point 4: Develop and Communicate Explanations and Findings (KS 5.3)

- Claim-Evidence-Reasoning model (SEP TEKS 5.3A)
- Communicate explanations in a variety of settings and formats (SEP TEKS 5.3B)
- Listen to others' explanations (SEP TEKS 5.3C)
- Engage in respectful scientific discussion (SEP TEKS 5.3C)

PRACTICE A

Investigation: Explanation

Instructions: Based on the data you observed and collected 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
Evidence What evidence from the investigation supports your claim?	WRITE HERE

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.

PRACTICE A

Investigation: Evaluation

After completing investigations, scientists evaluate their design. **Instructions:** Evaluate this investigation's design. In the box below, describe how it could be improved for more accurate data?

WRITE HERE

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