Closing *the* Distance

A Flexible Tutorial *for* TAKS™

Grade 5 Science

region 4®
Educated Solutions

Observations and Inferences
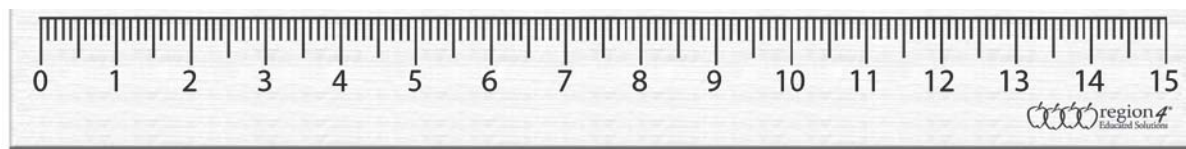
TEKS

2009–2010

5.2   Scientific processes. The student uses scientific methods during field and laboratory investigations. The student is expected to:
   (B) collect information by observing and measuring;
   (C) analyze and interpret information to construct reasonable explanations from direct and indirect evidence;
   (D) communicate valid conclusions; and
   (E) construct simple graphs, tables, maps, and charts using tools including computers to organize, examine, and evaluate information.

2010–

5.2   Scientific investigation and reasoning. The student uses scientific methods during laboratory and outdoor investigations. The student is expected to:
   (C) collect information by detailed observations and accurate measuring;
   (D) analyze and interpret information to construct reasonable explanations from direct (observable) and indirect (inferred) evidence;
   (F) communicate valid conclusions in both written and verbal forms; and
   (G) construct appropriate simple graphs, tables, maps, and charts using technology, including computers, to organize, examine, and evaluate information.

TAKS™

Objective 1   The student will demonstrate an understanding of the nature of science.
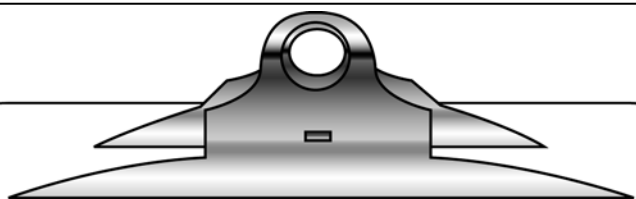
Lesson Plan Notes

Teacher Notes:

An *observation* is something that can be made using our five senses. Observations may also be measured, such as length, mass, or volume.

An *inference* is an interpretation based upon direct observations combined with prior knowledge.

Key Questions

By the end of this lesson, students should be able to answer these key questions:

- What is an observation?

- What is an inference?

- What is the difference between an observation and an inference?

Vocabulary Focus

evidence
infer/inference
interpret
observe/observation
valid conclusion

SAMPLE

Focus on:

analyze
collect
communicate
construct
interpret
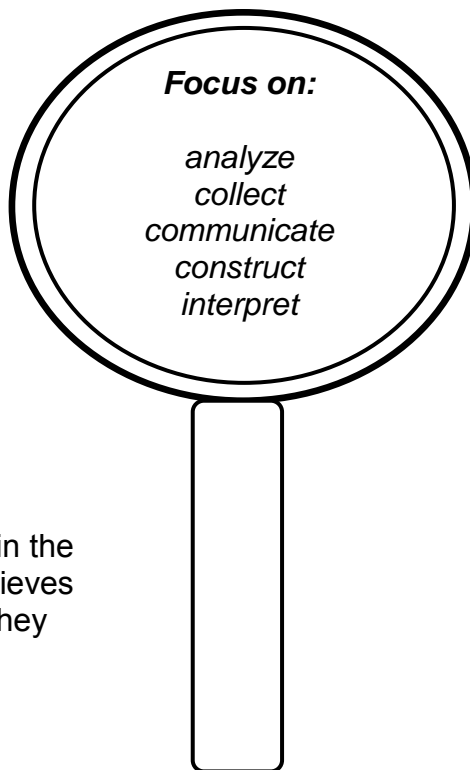
Teach the concepts using the process verbs in the TEKS. They are specific to what the state believes students should be capable of doing once they have mastered the concept.

Closing the Distance: A Flexible Tutorial for TAKS™

ENGAGE

The Engage phase of the lesson is designed to access students' prior knowledge of making observations. This phase is designed for whole-group instruction.

5 Minutes

Directions

1. Have students close their eyes as you ask each of the questions below.

2. Instruct students to visualize the events in their minds.

Facilitation Questions

- **How are observations made?**
  Observations are made using scientific tools as well as our five senses.

- **What is an inference?**
  An inference is an explanation based on observations and prior knowledge.

- **If you smell smoke, which sense or body part are you using to make the observation?**
  the sense of smell, nose

- **What do you assume is happening if you smell smoke?**
  something is burning

- **Is this an observation or an inference?**
  inference

- **If you hear water hitting the roof, which sense or body part are you using to make the observation?**
  the sense of hearing, ears

- **What do you assume is happening if you hear water hitting the roof?**
  it is raining outside

- **Is this an observation or an inference?**
  inference

- **How is an inference different from an observation?**
  Observations are made by using your senses. Inferences are thoughts or ideas based upon observations and prior knowledge. An inference can be figured out after making observations. An observation is concrete. An inference may be vague or imprecise.

- **Why is it important for a scientist to make many observations?**
  A scientist makes many observations during an investigation and repeats investigations to obtain reliable data and results. All the data from an investigation should be studied and analyzed so the results of the investigation can then lead to a valid conclusion.

EXPLORE

The Explore phase of the lesson provides the student with an opportunity to be actively involved in investigating the difference between making an observation and making an inference. This phase is designed as a small-group activity.
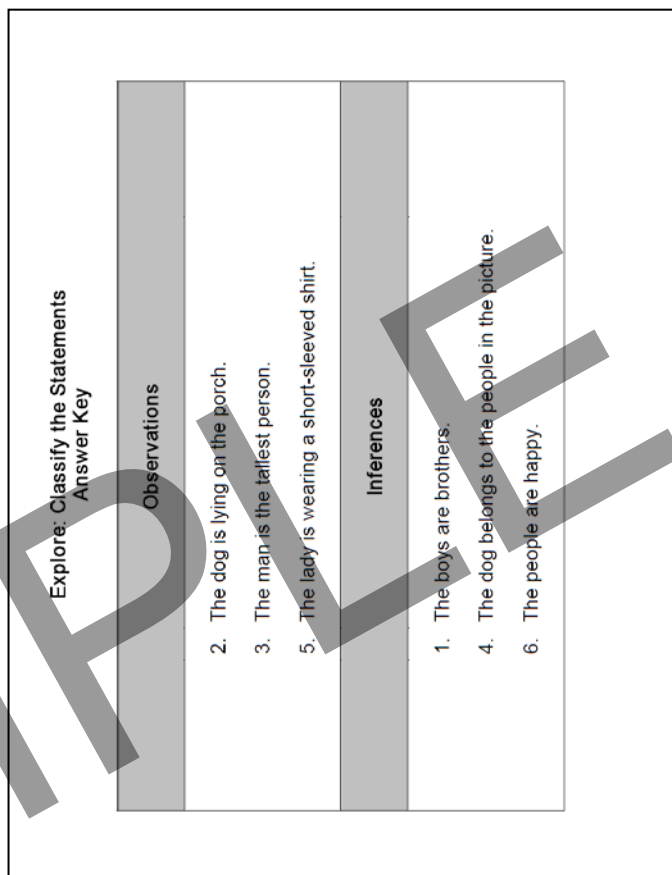
15 Minutes

Materials
For each group of 4–5 students
- **Explore: Classify the Statements**, printed on cardstock, laminated, and cut apart
- **Explore: What Do You Think?** printed on cardstock and laminated
- Masking tape

Directions
1. Have each student group create a T-chart on their desks or lab table using masking tape.

2. Distribute the cut and laminated statements from **Explore: Classify the Statements** and a copy of **Explore: What Do You Think?** to each student or group of students.

3. Have each student group observe the picture and classify the correlating statements as observations or as inferences.

4. Actively monitor student work and ask facilitation questions when appropriate.

Explore: Classify the Statements
Answer Key

Observations

2. The dog is lying on the porch.
3. The man is the tallest person.
5. The lady is wearing a short-sleeved shirt.

Inferences

1. The boys are brothers.
4. The dog belongs to the people in the picture.
6. The people are happy.

EXPLAIN

The Explain phase of the lesson provides students with an opportunity to express their understanding of observations and inferences. The teacher will use this opportunity to clarify key vocabulary terms and connect student experiences in the Explore phase with relevant concepts.

10 Minutes

Materials
For each group
- Two index cards

Directions
1. Use the facilitation questions to lead a whole-group discussion as students share their classification of the statements.

Facilitation Questions

- **Is Statement #1 an observation or an inference? Why?**
  Statement #1 is an inference. It may be interpreted that the two boys are brothers because they seem to be a part of the family group. There are two boys in the picture, but they could simply be friends or cousins.

- **Is Statement #2 an observation or an inference? Why?**
  Statement #2 is an observation. The dog is lying on the porch. The dog can be observed using the sense of sight.

- **Is Statement #3 an observation or an inference? Why?**
  Statement #3 is an observation. The man is the tallest person in the picture. Height can be observed using the sense of sight.

- **Is Statement #4 an observation or an inference? Why?**
  Statement #4 is an inference. It may be interpreted that the dog belongs to the people because the dog seems to be content in being with the people.The dog may belong to one of the people in the picture, to the neighbor next door, or simply be a stray.

- **Is Statement #5 an observation or an inference? Why?**
  Statement #5 is an observation. The lady is wearing a short-sleeved shirt. Length can be observed using the sense of sight.

- **Is Statement #6 an observation or an inference? Why?**
  Statement #6 is an inference. It may be interpreted that the people are happy because they are smiling. The people may simply be smiling because their picture is being taken.

Directions
2. Pass two index cards to each group.

3. Have each group write a definition of *observation* on an index card and place it at the top of one column in the T-chart.

4. Have each group write a definition of *inference* on the remaining index card and place it at the top of the other column in the T-chart.

5. Have groups share and compare their definitions with the class. Correct misconceptions.

6. Refer to Teacher Notes on page 2 of this lesson for possible definitions.

ELABORATE

The Elaborate phase of the lesson affords students the opportunity to extend or solidify their knowledge of observations and inferences. This phase is designed for groups of 4 students.

10 Minutes

Materials

For the teacher

- **Elaborate: Transparency Making Observations and Inferences**

For each group of four students

- **Elaborate: Making Observations and Inferences**, pages 1–3

Directions

1. Model for the students how to make observations and inferences using **Elaborate: Transparency Making Observations and Inferences**.

Facilitation Questions

- **What can be observed about the graph on Elaborate: Transparency Making Observations and Inferences?**
  The greatest amount of erosion occurred in 2002. Two meters of land were eroded from the beach in 2000. In 1999, 2001, and 2003, Flagstone Beach had an erosion rate of one meter per year.

- **What can be inferred about the graph on Elaborate Transparency: Making Observations and Inferences?**
  In 2000, a tropical storm hit Flagstone Beach. A hurricane hit Flagstone Beach in 2002. Between 2002 and 2003, a retaining wall was built on the beach to help prevent erosion.

Directions

2. Distribute **Elaborate: Making Observations and Inferences**, one page per group. Two groups can have the same page.

3. Have each group make at least two observations and two inferences of the graphic on their activity sheet.

4. Have students share observations and inferences. Display the transparency of each activity sheet as the groups share with the class.

Facilitation Questions

- **What can be observed about the graphic on #1 Making Observations and Inferences?**
  At 9:00 a.m., the puddle was bigger than at 1:00 p.m. There is no puddle under the swing at 5:00 p.m. There are three swings.

- **What can be inferred about the graphic on #1 Making Observations and Inferences?**
  It is a sunny day. The water evaporated into the air as water vapor. The water soaked into the ground. A dog drank the water.

- **What can be observed about the data table on #2 Making Observations and Inferences?**
  Plant B grew the tallest. Plant E grew the least. Plants A, C, and D grew about the same amount.

- **What can be inferred about the data table on #2 Making Observations and Inferences?**
  Plant B received fertilizer. No one watered Plant E. Plants A, C, and D were planted in pots. Plant B was planted in the ground outside.

- **What can be observed about the graph on #3 Making Observations and Inferences?**
  The population of Texas increased from 1960–2000. Between 1970 and 2000, the population increased by 10 million people. In 1960, the state of Texas had a population of almost 10 million people.

- **What can be inferred about the graph on #3 Making Observations and Inferences?**
  The population of Texas will reach 25 million by 2010. People moved to Texas because the education programs were excellent. The population increased from 1960 to 2000 because Texas does not have snowy, cold winters.

- **How can we make observations?**
  Observations can be made using our five senses and measuring tools.

- **What is it called when someone interprets or draws a conclusion about what they observe?**
  an inference

- **Can two people observe the same picture and make different inferences?**
  yes

- **Why does that happen?**
  Two people can make observations of the same thing but interpret or give meaning to it in different ways because they have different experiences or prior knowledge.

EVALUATE

During the Evaluate phase of the lesson, the teacher will assess student learning about the concepts and procedures that the class investigated and developed during the lesson.

Materials

For each student

- **Evaluate: Observations and Inferences**
- **Closing the Distance: Student Achievement Data Chart**

Directions

1. Distribute **Evaluate: Observations and Inferences** to each student.

2. Prompt students to complete **Evaluate: Observations and Inferences**.

3. Upon completion of **Evaluate: Observations and Inferences**, the teacher should use the error analysis provided below to assess student understanding of the concepts and procedures the class addressed in the lesson.

Answers and Error Analysis for Evaluate: Observations and Inferences

Question Number	Correct Answer	TAKS™	2009 TEKS	2010 TEKS	Conceptual Error			Procedural Error			Guess
1	C	1	5.2A	5.2B	B	D					A
2	C	1	5.2C	5.2D	A	B	D				
3	A	1	5.2C	5.2D	B	C	D				
4	B	1	5.2C	5.2D	A	C					D

Activity 2—Student Achievement Data Record

Materials

For each student

- **Closing the Distance: Student Achievement Data Chart**

Directions

1. Distribute **Closing the Distance: Student Achievement Data Chart** to each student.

2. Explain to students that they will be keeping a record of their Evaluate scores for each lesson on the data sheet.

3. Instruct students to record the number of correct items they scored on **Evaluate: Observations and Inferences** using the **Closing the Distance: Student Achievement Data Chart**.

4. Choose to either collect the data sheets each day or instruct students to keep them in a safe place such as a binder or journal for use each day.

5. Inform students that they will be graphing the information during the last lesson.

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Explore: Classify the Statements
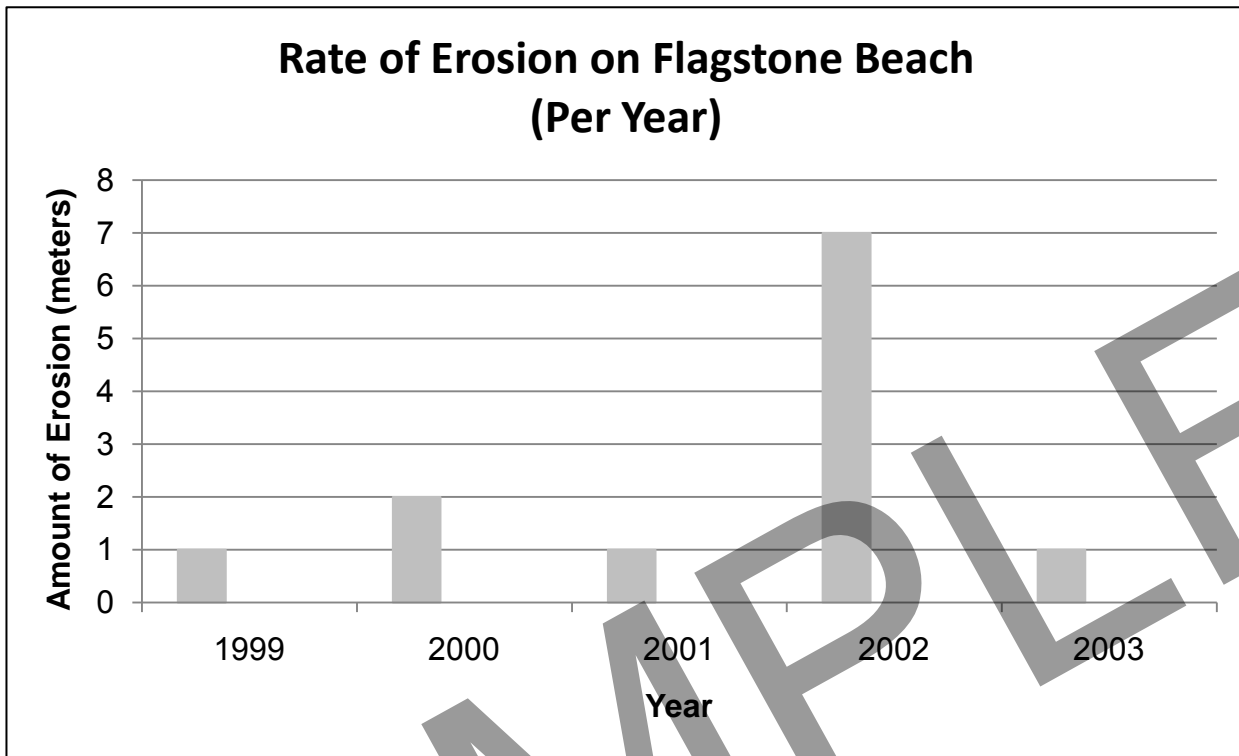
Cut along dotted lines.

1. The two boys are brothers.

2. The dog is lying on the ground.

3. The man is the tallest.

4. The dog belongs to the people in the picture.

5. The lady is wearing a short-sleeved shirt.

6. The people are happy.

Explore: What Do You Think?

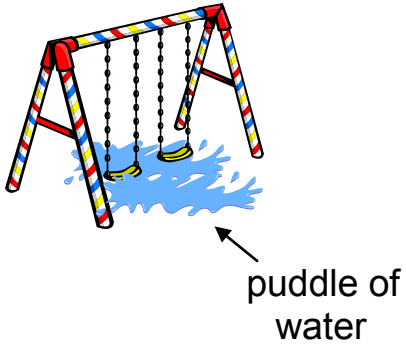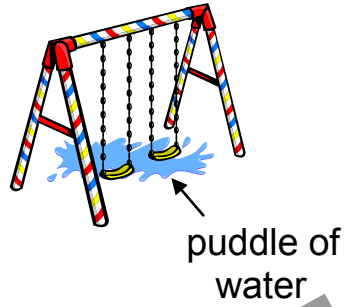## Elaborate: Transparency Making Observations and Inferences

Rate of Erosion on Flagstone Beach
(Per Year)

Amount of Erosion (meters)

Year	Amount
1999	1
2000	2
2001	1
2002	7
2003	1

Year

SAMPLE

Observations: _____

_____

_____

Inferences: _____

_____

_____

Elaborate: #1 Making Observations and Inferences

| 9:00 a.m. | 1:00 p.m. | 5:00 p.m. |

puddle of
water

puddle of
water

Observations:_____

_____

_____

Inferences:_____

_____

_____

Elaborate: #2 Making Observations and Inferences

Plant Investigation

Plant	Beginning Height	Height After One Week
A	1 cm	5 cm
B	1 cm	12 cm
C	1 cm	5.5 cm
D	1 cm	5.7 cm
E	1 cm	2 cm

Observations: _____

_____

_____

Inferences: _____

_____

_____

Elaborate: #3 Making Observations and Inferences

Population Growth of the State of Texas
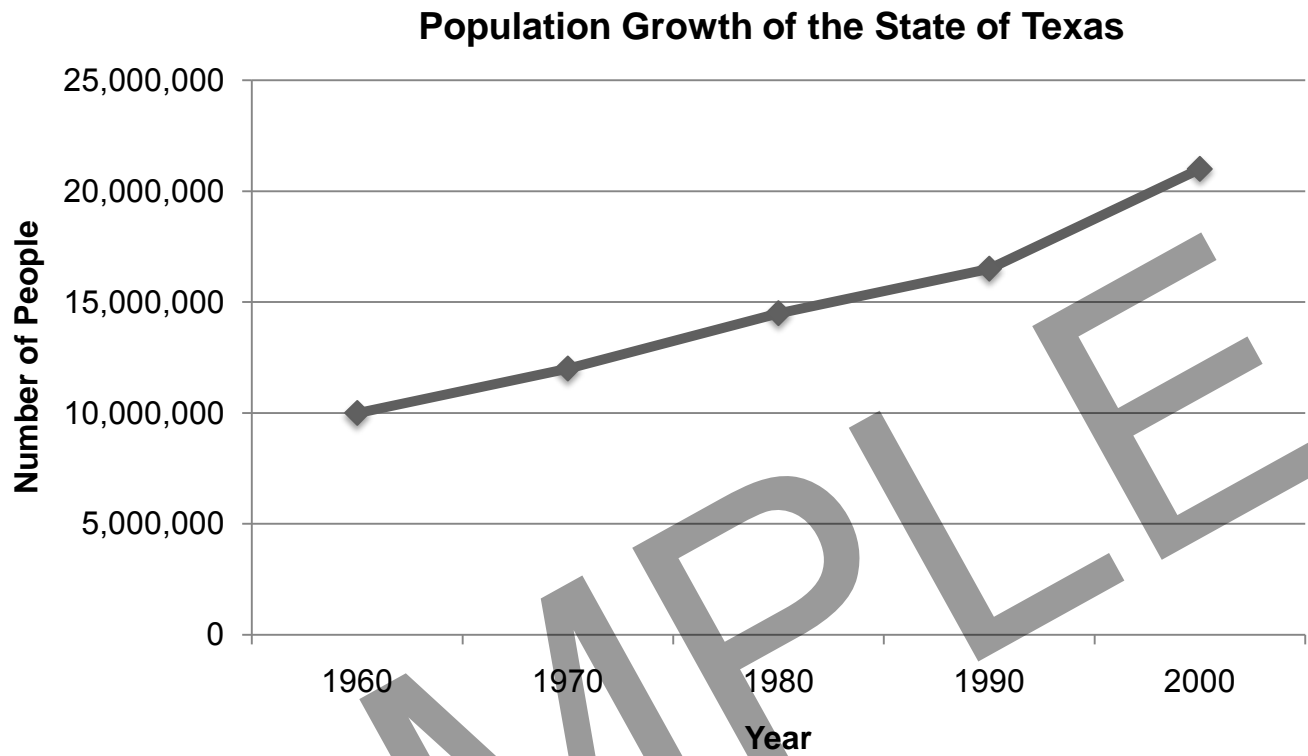
Observations: _____

_____

_____

Inferences: _____

_____

_____

Name: _____ Date: _____

Evaluate: Observations and Inferences


Heat Source

Timer

Water   Sand
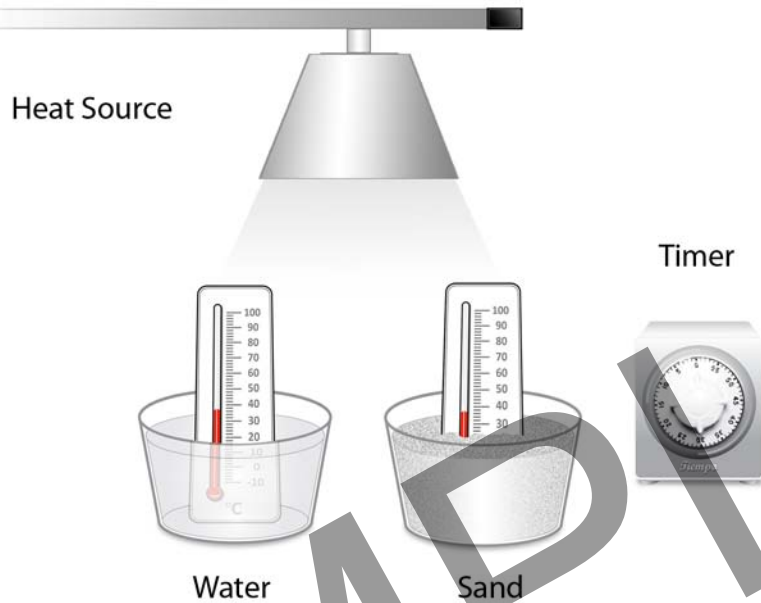
1 A group of students uses the set-up to conduct an investigation. Which hypothesis is the group of students most likely testing?

  Ⓐ The amount of rainfall affects the growth of plants.

  Ⓑ Wind is caused by the Sun's gravitational pull on Earth.

  Ⓒ Land areas heat up faster than bodies of water on Earth's surface.

  Ⓓ The density of water is the same as the density of sand.
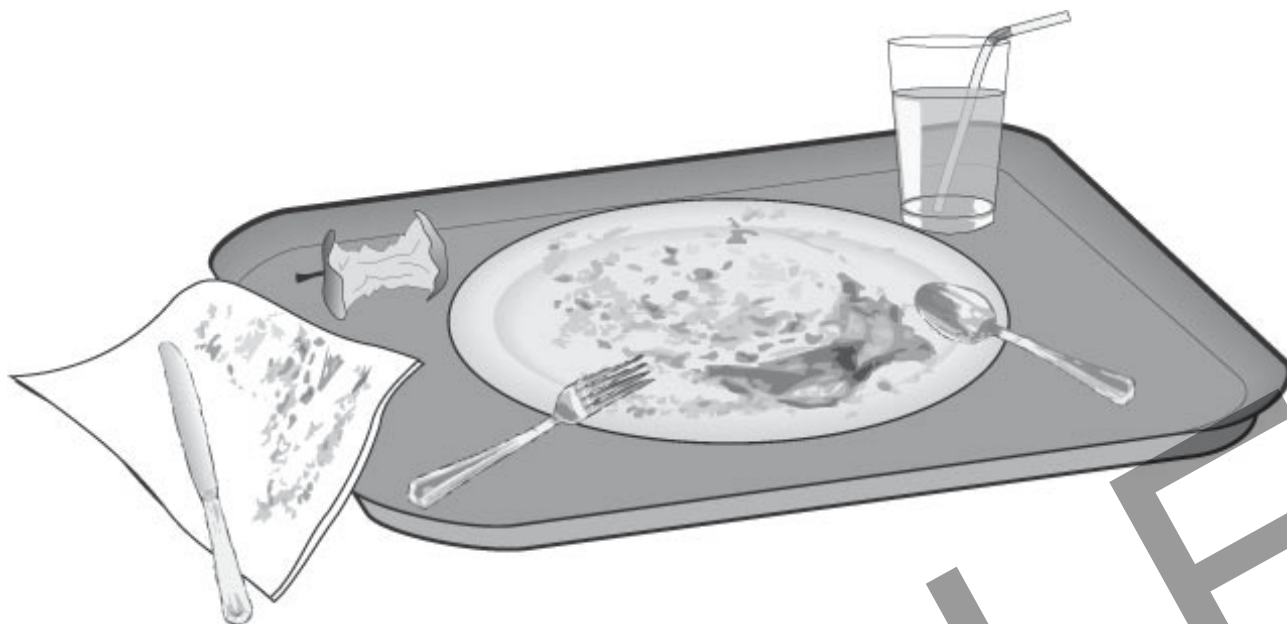
2 Which of the following statements is an observation about the picture?

Ⓐ The food tasted good.

Ⓑ The cup is made of glass.

Ⓒ The plate is circular.

Ⓓ The food was warm.
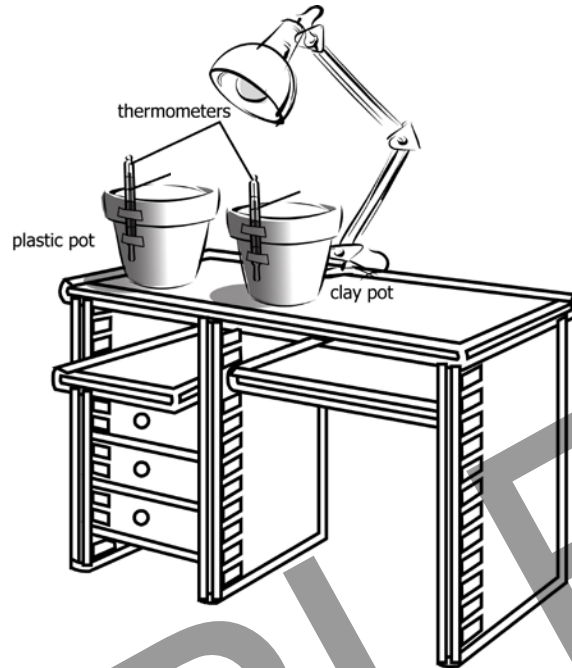
**3** Which of the following statements is an inference about the picture?

    Ⓐ The student is about to do an experiment.

    Ⓑ Two plastic pots are sitting on the desk.

    Ⓒ The student is wearing a lab coat.

    Ⓓ The desk has drawers.

4 A seedling was planted in a pot of soil and placed on a sunny windowsill. The plant received the sunshine and water that it needed to grow. Which graph most likely shows the growth of the plant?
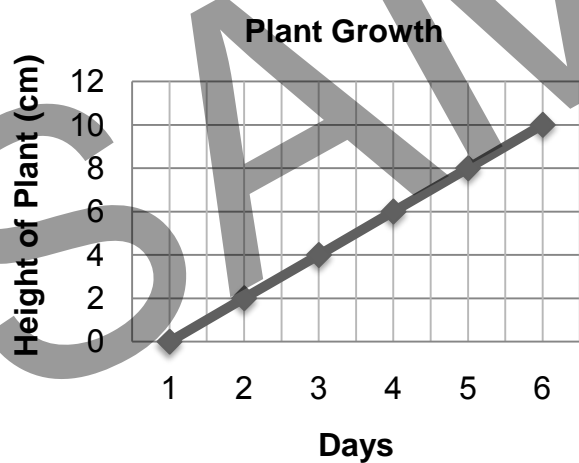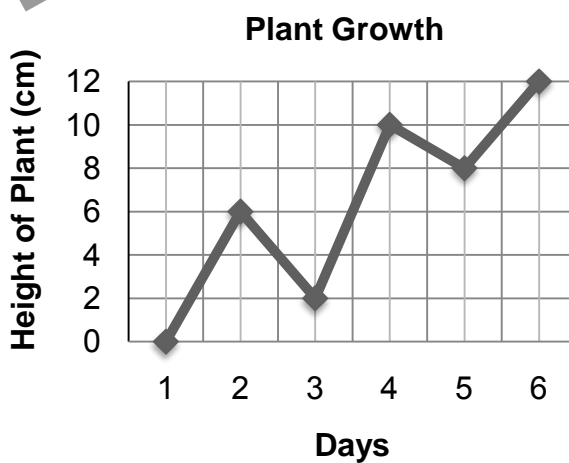
A

Plant Growth

C

Plant Growth

B

Plant Growth

D

Plant Growth
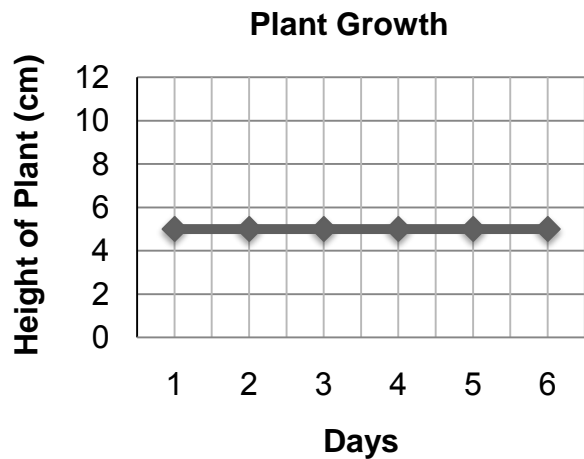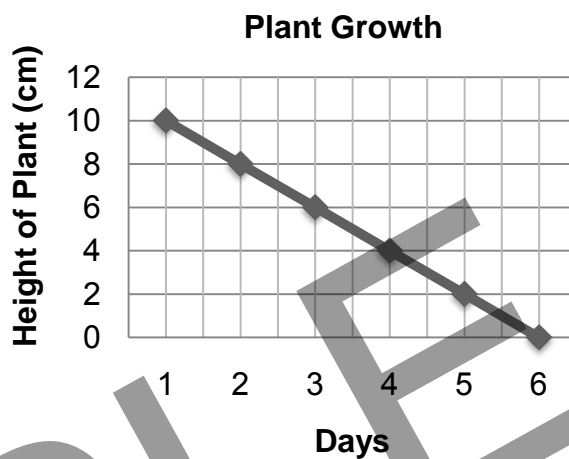
Name: _____ Date: _____

Closing the Distance: Student Achievement Data Chart

	Lesson	**Objective**	**# Correct**	**# Total**
1	Observations and Inferences	1		4
2	Designer Adaptations	2		4
3	Energize Your Life	2		4
4	A Dissolving Situation	3		4
5	What's the Point?	3		4
6	Bending Light	3		4
7	Cycles in Nature	1, 4		4
8	Retain or Drain?	4		4
9	Resourceful Thinking!	4		4
10	Old News	4		4
11	Rapidly Changing	4		4
12	Slowly Changing	4		4
13	Mooning Over Earth	4		4
14	Patterns of Change	1, 2, 4		4
15	Charting Success	1		4

Objective 1 = Nature of Science
Objective 2 = Life Science
Objective 3 = Physical Science
Objective 4 = Earth Science

Explain: Vocabulary Cards

Cut along dotted lines.

1		1	
	explore		*identify*

1		1	
	illustrate		*infer/inference*

1		1	
	interpret		*investigate*

1		1	
	measure		*observe*

1		1	
	patterns		*rapid*

1		1	
	recognize		*test*

SAMPLE

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Explain: Vocabulary Cards

Cut along dotted lines.

to name an object or process based on its physical properties or behaviors	*to search for information and meaning*
making an explanation using observations and information already known	*to represent ideas visually or verbally*
to study in a systematic way	*to understand the meaning of or behind something*
to determine characteristics or properties by using our senses and other science tools	*to find the quantity of something*
happening quickly, sometimes without warning	*a repeating series of events*
to try out or investigate	*to identify based on specific characteristics*

SAMPLE