

TITLE: STIMULUS AND RESPONSE

AUTHOR:

TEAM MEMBERS:

DATE LESSON TO BE TAUGHT:

GRADE LEVEL: 5

CONCEPT(S): A stimulus elicits a response. Repeated investigations involving stimulus/response provide information from which accurate predictions can be made. Introducing a variable into the investigation can change the results.

OBJECTIVES The student will be able to:	Evaluation Question for each Objective												
Operationally define stimulus and response	A stimulus is A. something that causes a stimulus B. something that starts to respond C. something that causes a response D. something that starts a stimulus												
	A response is A. the reaction caused by a stimulus B. the reaction to an event C. the reaction to an occurrence D. all of the above												
Classify stimulus/response interactions	Match the stimulus on the right with the corresponding response on the left: <table><tr><td><u>Stimulus</u></td><td><u>Response</u></td></tr><tr><td>I.The wind blows.</td><td>A. My dog barks at the mail man.</td></tr><tr><td>II.The mail man comes in my yard.</td><td>B. I answer the phone.</td></tr><tr><td>III.A cat hears a can opener.</td><td>C. The students raise their hands.</td></tr><tr><td>IV.A phone rings.</td><td>D. A tree limb falls down</td></tr><tr><td>V.The teacher asks a question.</td><td>E. The cat runs into the kitchen.</td></tr></table>	<u>Stimulus</u>	<u>Response</u>	I.The wind blows.	A. My dog barks at the mail man.	II.The mail man comes in my yard.	B. I answer the phone.	III.A cat hears a can opener.	C. The students raise their hands.	IV.A phone rings.	D. A tree limb falls down	V.The teacher asks a question.	E. The cat runs into the kitchen.
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Describe stimulus/response interactions within a given ecosystem.	A waste treatment plant is located near a bayou, which houses many types of flying fish. The plant receives a majority of its water from the bayou. During warmer months, the amount of flying fish												

	<p>decreases by 6%. Which of the following provides a reasonable stimulus for the decrease in flying fish population in the bayou?</p> <p>A. The flying fish don't like the loud sounds of the machines in the waste treatment plant.</p> <p>B. More water is used by consumers during warmer months, which decreases the amount of water the flying fish can live in.</p> <p>C. Less water is filtered by the water treatment plant during warmer months, allowing the fish to travel upstream.</p> <p>D. None of the above are reasonable stimuli.</p>
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Texas Essential Knowledge and Skills (TEKS)

5.1 Scientific processes. The student conducts field and laboratory investigations following home and school safety procedures and environmentally appropriate and ethical practices
The student is expected to:

(A) demonstrate safe practices during field and laboratory investigations.

5.2 Scientific processes. The student uses scientific methods during field and laboratory investigations. The student is expected to:

(A) collect information by observing and measuring;

(B) analyze and interpret information to construct reasonable explanations from direct and indirect evidence; and

(C) communicate valid conclusions.

5.5 Science concepts. The student knows that a system is a collection of cycles, structures, and processes that interact. The student is expected to:

(A) describe some cycles, structures, and processes that are found in a simple system; and

(B) describe some interactions that occur in a simple system.

VOCABULARY:

Response: the reaction to an occurrence or event

Stimulus: something that causes a response

MATERIALS LIST AND ADVANCED PREPARATIONS:

For the class:

- Labels: Stimulus and Response (1 for each group of 2 students)
- Pictures: Stimulus and Response (1 for each group of 2 students)
- Large Sticky note chart paper (1 for each group of 2 students)
- Masking Tape
- Flashlights (1 for each group of 2 students)
- Overhead projector or document camera

<p>Post the picture of the person answering the phone beneath the label of “response”.</p> <p>Pass to each group of 2 students the stimulus/response labels and picture cards. Students work w/ their partner to classify the diagrams below the “stimulus” and “response” categories.</p> <p>Ask students to focus only on the group representing the examples of stimuli, and look for characteristics they have in common. (Explain that the plural of stimulus is stimuli, to avoid confusion.) Have student groups discuss the characteristics that these pictures have in common, and write a short definition in their own words for the term “stimulus” on a sentence strip.</p> <p>Ask students to focus only on the group representing the examples of responses, and look for characteristics they have in common. Then, have student groups discuss the characteristics that these pictures have in common, and write a short definition in their own words for the term “stimulus” on a sentence strip.</p> <p>Stick the sentence strips on the appropriate sides of the</p>	<p>Do you agree with the placement of the pictures under these headings? (<i>various responses</i>).</p> <p>What do all of these examples have in common? (<i>various responses</i>)</p> <p>What is the general term for something that causes a</p>	<p>The student’s job is to discover the attributes or characteristics of a stimulus and a response.</p> <p>Students work collaboratively to form their own definition of the term stimulus. They come to consensus and write this on a sentence strip.</p> <p>Students work collaboratively to form their own definition of the term response. They come to consensus and write this on a sentence strip.</p>
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<p>board (under the labels). Discuss and combine the student definitions into a class definition. (<i>A stimulus is anything that causes a reaction in a living organism. A response is the reaction caused by the stimulus.</i>)</p> <p>State that today the students will investigate factors that affect the stimulus-response chain.</p>	<p>response? (<i>stimulus</i>)</p> <p>Does a given stimulus always get the same response? (<i>No</i>) Why or why not? (<i>Many times there are a variety of ways to respond to a given stimulus.</i>)</p>	
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TRANSITION		
<p>One characteristic that distinguishes living organisms from nonliving things is the ability to sense and respond to conditions or changes in the environment. Any substance or condition in the environment that causes an organism to react is called a stimulus. The reaction of the organism to a stimulus is called a response. Living organisms are able to sense and adjust to a variety of stimuli in the environment using special sensory receptors that help them detect changes in light, odor, sound, and textures. Sensory receptors can be as simple as the sensory cells in jellyfish that are connected in a net-like arrangement, or as complex as the sensory organs in humans, such as eyes, ears, or a nose. State that today the students will investigate factors that affect the stimulus-response chain.</p>		

EXPLORATION		
What the Teacher Will Do	Eliciting Questions/ Student Responses	What the Students Will Do
<p>Teacher will disseminate the Activity packet to each group of 2 students. <i>Work with your group to complete two of the three activities that will further your understanding of how organisms respond to stimuli in their</i></p>	<p>How many people form a group? (2).</p>	<p>Students work to complete all 3 activities in the packet with a partner.</p>

<i>environments.</i>		.
Teachers will describe how students will do Activity 1: Responding to Balancing Challenges. <i>Read directions carefully. Put sticky note on the floor. Each partner should do the 5 challenges. Be very careful not to spin too quickly. If you feel dizzy – stop and sit down immediately. Be sure to answer 3 questions at end of activity.</i>	<p>What do you do if you are not sure what to do? (<i>Read the directions, ask for help.</i>)</p> <p>Do both partners try the challenge? (<i>yes</i>)</p> <p>What do you do if you feel dizzy? (<i>stop, sit down, tell the teacher.</i>)</p>	Students will listen to directions and answer procedural questions.
Teachers will describe how students will do Activity 2: A Delicate Balance: <i>Silently read the passage. Carefully read the direction and conduct the eye experiment with your partner. Never shine the light directly into the volunteers eyes (model this). Work with your partner to answer all 3 questions.</i>	Does the flashlight need to shine directly into your partners eyes? (NO)	Students will listen to directions and answer procedural questions
Teachers will describe how students will do Activity 3: Which one Does not Belong? <i>Work with your partner and complete the activity by circling the word that does not belong and then writing your explanation of why it does not belong.</i>		Students will listen to directions and answer procedural questions
Let the groups begin exploring. Monitor and ask questions to facilitate understanding for all students.	How did it feel when you stood with one foot on the sticky note w/ your eyes open? (<i>We moved a little from side to side trying to stay balanced.</i>)	Students participate in each of the 3 activities and respond reflectively to teachers questions when prompted.

	<p>How did it feel when you stood with one foot on the sticky note w/ your eyes closed? <i>(Almost like falling to one side, larger arm movements to stay balanced.)</i></p> <p>How did it look when your partner was trying to balance on one foot with closed eyes? <i>(arms and body moved from side to side as they tried to correct their balance).</i></p> <p>Why was the feeling different with your eyes closed? <i>(answers will vary)</i></p> <p>What happened when you spun around 4 times and then stopped? <i>(It felt like the room was spinning, and it was very hard to keep balance on the sticky note)</i></p> <p>What is the relationship between the amount of light and pupil size? <i>(As the amount of light decreased, the size of the pupil increased. As the amount of light increased, the size of the pupil decreased)</i></p> <p>Why does the eye respond to bright light by decreasing the size of the pupil? <i>(To prevent too much bright light from entering and damaging the eye.)</i></p> <p>Why does the eye respond to dim light by increasing the size of the pupil? <i>(To</i></p>	
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	<p><i>allow as much light as possible into the eye so the person can see.)</i></p> <p>What is the external environmental factor that is being controlled by the response movements of the eye? (<i>Light</i>).</p> <p>Can you think of examples of times when your eyes could not respond and balance the amount of light entering the eye? (<i>After having an eye exam where the eyes are dilated, so the pupil stays large for several hours. What do people have to wear to assist after they've had their eyes dilated? (dark sunglasses).</i></p> <p>Ask students to think of ways that other living things stay in balance. (<i>various responses</i>)</p>	
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TRANSITION		
<p>In your groups you did several stimulus response activities. We are going to share the results of your explorations.</p>		

EXPLANATION		
What the Teacher Will Do	Eliciting Questions/ Student Responses	What the Students Will Do
<p>Teacher will ask student groups to share their data from their explorations.</p>	<p>What is a/the stimulus? What is a/the response?</p>	<p>Student groups will share their understanding of stimulus and response through</p>

<p>Each group will report out on a different question from the exploration.</p> <p>Teacher will ask scaffolding questions during group presentations.</p>	<p>Why is it important for organisms to be able to respond to/interact with both the living and non-living parts of their environments? (<i>in order to meet its needs and stay alive. There is a constant exchange of materials between an organism and the non-living parts of the environment</i>)</p> <p>What are the non-living parts of an organism's environment called? (<i>abiotic</i>)</p> <p>What are some examples of abiotic factors in an ecosystem? (<i>water, light, soil, rocks, wind</i>)</p> <p>What are the living parts of an organism's environment called? (<i>biotic</i>)</p> <p>What are some examples of biotic factors in an ecosystem? (<i>animals, trees, plants, etc...</i>)</p> <p>Does anyone have any questions?</p>	<p>summarizing and explaining their explorations.</p>
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<p>TRANSITION</p>
<p>There are many, many examples of stimulus and response reactions. Can anyone share an example they can think of?</p>

ELABORATION		
What the Teacher Will Do	Eliciting Questions/ Student Responses	What the students Will Do
<p>Today we explored the concepts of stimulus and response. Working with your group of 4 make a list of other things that serve as a stimulus, and beside that word or phrase, write the response you might expect. Each of you should show an example on your whiteboard.</p>	<p>What are some other examples of stimuli and responses? (<i>various student generated responses shown on their whiteboard</i>)</p>	<p>Turn handlebars of bike – Bike turns a different direction.</p> <p>Get an F on a test – Parents get angry.</p> <p>Smile at another person – Get a smile back.</p>

Exploration: Stimulus and Response Lab

Task: Work with your group to complete two of the three activities that will further your understanding of how organisms respond to the stimuli in their environments.

Activity 1: Responding to Balancing Challenges

Problem: Can you remain balanced for 30 seconds while standing on one foot?

Procedures:

1. Place a piece of tape or sticky note on the floor.
2. Take turns having one volunteer at a time try the following challenges while the rest of the group observes the event.

Challenges (30 seconds each)

- Balance w/ one foot on the tape and both eyes open
 - Balance w/ one foot on the tape and both eyes shut
 - Balance w/ one foot on the tape, eyes open, and arms held tightly against your side
 - Slowly spin around 4 times, and then balance with one foot on the tape w/ eyes open
 - Slowly spin around 4 times, and then balance with one foot on the tape w/ eyes shut
3. Record the answers to the following 3 questions.
 1. What did you observe as the volunteer tried to maintain a balanced position?
 2. What actions did the person take to recover his or her balance?
 3. Which challenge was most difficult? Why?

Activity 2: A Delicate Balance

Read and discuss the following passage.

Have you ever watched a gymnast walk on a balance beam? With each step, the gymnast must make small balancing movements similar to the ones that you made when balancing on the piece of tape. Years of training and practice help the gymnast make very small balancing movements to avoid large over corrections that might cause a loss of balance. This allows the gymnast to give a smooth, balanced performance.

The semicircular canals in our inner ears contain tiny hairs that help us maintain balance or equilibrium. Gravity plays an important role in balance. The tiny hairs can be moved by fluid as it is pulled downward by the force of gravity when our head changes position quickly. Nerves carry the message from the hairs to the brain, which causes the body to react and regain balance. This might cause a dizzy or spinning sensation, especially when sight is not being used to help the body as it maintains balance.

Most living things thrive in a balanced environment, and can tolerate a very narrow range of changes in their external environment without suffering harm or death. In order to survive, living things must constantly make adjustments to keep internal conditions constant and balanced, in spite of changes that occur in the external environment. For example, when warm-blooded animals are in cold temperatures, they may respond by shivering to increase body temperature by muscle movement. They also may develop “goose bumps” by making hair stick out straight to trap a layer of air for insulation. In extremely hot temperatures, animals may respond by sweating or panting to cool off. These responses automatically occur when body temperatures rise above or fall below the animal’s most favorable temperature range.

Plants have different types of response than animals, because plants have different needs. Light is one of the most important abiotic factors in a plant’s environment because it is needed for photosynthesis. Plants have special growth chemicals that will cause a plant to grow toward light, even if it causes stems to have a sideways growth.

Many animals, including humans, also respond to light. Work with your group to conduct the following investigation.

Problem: How do human eyes respond to varying amounts of light?

Procedures:

1. Position a flashlight so that the light shines toward a volunteer, but not directly into his or her eyes. Observe the volunteer’s eyes as he or she looks toward and away from the light.
2. Trade positions so that the volunteer can make observations of someone else’s eyes as they respond to light.

Questions:

1. Describe the response of the volunteer’s eyes to the light.
2. What is the relationship between the amount of light and the pupil size?
3. Why does the eye respond to light in this way?

Activity 3:

Place a check mark in the box that best represents the stimulus for each response listed. Be prepared to justify and share your results with the class.

Responses to Abiotic Factors in an Ecosystem

Response	Abiotic Factors					
	Water	Light	Air	Cold	Heat	Soil
A dog pants on a summer day.						
A cactus blooms after a rain.						
Bears hibernate in winter.						
A lizard sits on a warm rock.						
Plants grow toward sunny areas.						
A runner breathes rapidly after a race.						
Plants use carbon dioxide to make food by photosynthesis.						
Plant roots absorb minerals needed for growth						
Frogs lay their eggs near the edge of a pond.						