Ing the Power of Learning Lesson 2.14: Physical Science – Wave Theory and Sound

Weekly Focus: Reading for Comprehension Weekly Skill: Graphic Literacy

Lesson Summary: This week students will continue reading for comprehension with reading passages on sound and waves. Then, students will transfer their knowledge with the use of graphs and charts.

Materials Needed:

- Comprehension Reading: <u>Unit 2.14 Handout 1</u> (Spectrum Science, Grade 6, pages 94-95)
- Reading Passage & Graphic Literacy: <u>Unit 2.14 Handout 2</u>
- Extra Work/Homework: <u>Unit 2.14 Handout 3</u> (6-way paragraphs, Advanced Level, #45, pages 90-91)

Objectives: Students will be able to...

- Gain an understanding of wave theory and sound
- Understand science concepts in graphs and charts

College and Career Readiness Standards: RI, RST, WHST, SL

ACES Skills Addressed: EC, LS, ALS, CT, SM, N

<u>Notes:</u> Please review and be familiar with classroom routine notes for: reading for fluency strategies (<u>Routine 2</u>), summarizing techniques (<u>Routine 4</u>), and self-management skills (<u>Routine 1</u>). The notes will help with making a smooth transition to each activity.

GED 2014 Science Test Overview – For Teachers and Students

The GED Science Test will be 90 minutes long and include approximately 34 questions with a total score value of 40. The questions will have focus on three content areas: life science (~40%), physical science (~40%), and Earth and space science (~20%). Students may be asked to read, analyze, understand, and extract information from a scientific reading, a news brief, a diagram, graph, table, or other material with scientific data and concepts or ideas.

The online test may consist of multiple choice, drop down menu, and fill-in-the-blank questions. There will also be a short answer portion (suggested 10 minutes) where students may have to summarize, find evidence (supporting details), and reason or make a conclusion from the information (data) presented.

The work students are doing in class will help them with the GED Science Test. They are also learning skills that will help in many other areas of their lives.

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Activities:

W	arm-Up: K-W-L Chart Time: 5 - 10 minutes					
•	As students enter the class, have the following written on the board or overhead "Wave Theory					
	(light and sound) is moving energy from one point to another without moving matter (objects)."					
	Have students create a "KWL" chart on a piece of notebook paper (below). This helps to					
	activate students' prior knowledge by asking them what they already K now (column 1); students					
	(collaborating as a classroom unit or within small groups) set goals specifying what they W ant to					
	learn (column 2); and after reading students discuss what they have Learned (column 3).					
•	Students apply higher-order thinking strategies which help them construct meaning from what					
	they read and help them monitor their progress toward their goals.					

KWL Chart:

K - What (else) do I KNOW?	W - What do I WANT to know?	L - What did I LEARN?

Activity 1: Comprehension Reading (Unit 2.14 Handout 1) Time: 40 - 45 minutes

1) Distribute Unit 2.14 Handout 1 to students.

2) Explain to students that the purpose of the reading passage is to introduce them to key vocabulary and concepts surrounding sound, waves, and sonar. The reading discusses ultrasound and how it is used to see into our bodies.

3) Ask students to review the title and count the number of paragraphs in the reading passage. Ask students how they know where a paragraph begins. Explain that it is important to know how to find a paragraph quickly as some test questions may ask students to refer to a certain paragraph. If you have an overhead, point to it and/or label the indents.

4) Explain to students they should read all of the paragraphs silently in order to answer the questions that follow. To help students find the main idea of the reading passage, remind them to think "What are <u>all</u> of the paragraphs about?" and "What is the point that the author is trying to make?" while reading.

5) While students are reading, circulate and discuss with students that when reading for comprehension, there are many strategies to use: read the title to predict what the reading is about; look at images, use the vocabulary in bold to guide them to more meaning while reading. If there are images, they should use them to predict what they are going to read. Show the guide words on the left side of the page that help with definitions of key vocabulary in the reading.

6) Ask students to answer the questions from the reading on the back of the page.

7) Review answers as a whole class. Ask students to point out the evidence (proof) from the reading that led them to the answer

8) If there is extra time, have students read passage in pairs to promote reading fluency. If there is extra time or to challenge students, they can write a 3-5 sentence summary of all of the material

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presented, using Routine 4 Summarizing Techniques Handout.

Break: 10 minutes

Activity 2: Reading / Video / Worksheets (Unit 2.14 Handout 2) Time: 45 - 50 minutes

1) Distribute the handout (Unit 2.14 Handout 2) to students.

2) Explain to students that they will read a passage about wave theory. They should be reading for comprehension to understand the basics of wave theory. Discuss with students that the purpose of this passage is for students to gain the basic information about wave theory and sound that they may need to know for the 2014 GED Science Module.

3) Show the video clip (1:10 min) to reinforce the ideas presented in the reading passage. (Waves that go **along** the direction of the wave = **long**itudinal waves).

4) Review answers of the T-chart of the characteristics of transverse and longitudinal waves. You may have to show students how to use the T-chart – remind them it is a great graphic organizer to help them determine the differences in objects.

5) Have students continue with pages 3, 4, and 5. Discuss with students that the diagrams will help them understand parts of a wave. While students are working independently or in their table groups, circulate the classroom to make sure they understand the information presented in the diagrams.

6) Review answers as a whole class. Have students fill in the "L" part of their K-W-L chart from the warm-up activity.

7) If there is extra time, students can discuss in their table groups the information that was presented in the video and in the handouts.

Wrap-Up: Summarize

Time: 5 minutes

Have students turn to a partner (or write in their journals) about what they have learned today about wave theory and sound. They may want to discuss some of the areas that they would like to do further study on in the future. Their summary may include any wonderings they have about the subject. Note: Use Routine 4 Handout

Extra Work/Homework: Unit 2.14 Handout 3 Time: 20 minutes outside of class

Students can read and answer questions from the **Unit 2.14 handout 3**. It is a way to incorporate and expand upon the information from previous lessons on light.

Differentiated Instruction/ELL Accommodation Suggestions	Activity
If some student groups finish early, they can turn their paper over and summarize the	Activity 1
passage on thermodynamics and energy.	Handout 1
There may be a lot of new vocabulary and ideas for some students, be prepared to	Activity 2
assist by circulating while they are working on Unit 2.14 Handout 2 .	video and
	handout

Online Resources:

Online Interactive Wave Resources:

If students have Internet connection, they should try to use the online practice with to help further their understanding of wave.

http://w3.shorecrest.org/~Lisa_Peck/Physics/syllabus/soundlight/ch25waves/ch25_applets_videos/ch25_vid_applets.htm

Suggested Teacher Readings:

- GED Testing Service GED Science Item Sample (to get an idea of what the test may be like)
 http://www.gedtestingservice.com/itemsamplerscience/
- Assessment Guide for Educators: A guide to the 2014 assessment content from GED Testing Service:

http://www.riaepdc.org/Documents/ALALBAASSESSMENT%20GUIDE%20CHAPTER%203.pdf

• Minnesota is getting ready for the 2014 GED test! – website with updated information on the professional development in Minnesota regarding the 2014 GED.

http://abe.mpls.k12.mn.us/ged_2014_2

• ATLAS: ABE Teaching & Learning Advancement System: 2014 GED [®] Classroom: Science: Minnesota's state-wide website for resources for the science module

http://atlasabe.org/resources/ged/science

Unit 2.14 Handout 1 (2 pages total)

TEACHER ANSWER KEY

- **1.** c
- **2.** d
- **3.** C
- 4. the time it takes an ultrasound wave to travel from the probe and return as an echo
- 5. Answers may vary, possible answer: Both sonar and ultrasound use sound waves to "see" things, but sonar sound waves are big enough to be heard b human beings, wile ultrasound waves are too small.
- 6. There is much less risk using ultrasound than radioactive X-rays.

Unit 2.14 Handout 2 (5 pages total)

Reading Passage Mechanical Waves:

Waves are everywhere. We encounter them every day. We see light waves, hear sound waves, use microwaves, and maybe even do the wave in a football stadium. Even "waving" hello to someone is a wavelike motion. In the ocean or a lake, water ripples in waves. Those waves are caused by some disturbance, such as a rock dropped in the water, a moving boat, or larger movements deep at sea.

Simply put, a **wave** is a disturbance that transfers energy. Waves do not transfer matter, but may travel through it. The material a wave travels through to transport energy is called a **medium**. A medium can be solid, liquid, or gas. The wave travels through the medium, and displaces matter temporarily, but when the wave has passed, the matter returns to its original position. Waves that transfer energy through matter are called **mechanical waves**.

Mechanical waves can be transverse or compressional (also called longitudinal). A transverse wave moves matter perpendicular to the direction of the wave. One example of a transverse wave is a water wave. The wave travels forward through the water, but displaces the water either up or down. A wave on a string is also transverse, as are earthquake s-waves.



A transverse wave has high points called *crests*, and low points called *troughs*. The line exactly between those high and low points represents *rest position*. Crests and troughs represent the displacement of the particles that a mechanical wave travels through. The distance from the rest position to the crest, or from rest to the trough, is called the *amplitude*. Waves carrying more energy have higher amplitudes. A water wave with a high amplitude will be taller. The distance from one crest of the wave to the next crest is called the *wavelength*.

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Compressional (longitudinal)

waves displace matter in the same direction that the wave is traveling. Sound waves, an oscillating spring, and earthquake p-waves are compressional. As sound travels, particles of air are pushed forward, and then are pushed back to their original positions.

In a compressional wave, the movement of particles causes high

density in some areas and low density in others. In the high density area, called the **compression**, the particles are close together. In the low density area, called the **rarefaction**, the particles are spread out. Waves that carry more energy have more dense compressions. The amplitude of a compressional wave represents the density of the compressions. A sound wave with a bigger amplitude will be louder because the vibrations of air on your ear drum are larger. The wavelength of a compressional wave is the distance from the beginning of one compression to the beginning of the next compression.

Fill out the T-chart with information from the reading passage:

	Transverse Wave	Longitudinal Wave
T-chart should include: a) Definition for each term b) Example for each term c) List the parts of each term		



amplitude	wavelength crest equilibri	um trough
	X-rays microwaves ultravi Infrared rays short radio waves gamm	long radio waves visible light
(
	1	
tch each term in the	e word box above to its description.	
tch each term in the	e word box above to its description. This is a measure from a point on one wave on the next wave.	to the corresponding point
tch each term in the	e word box above to its description. This is a measure from a point on one wave on the next wave. This is the lowest point on a wave.	to the corresponding point
tch each term in the	e word box above to its description.	to the corresponding point

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iu rareraction. Us	e the terms in the word box to laber the par	ts of a sound wave.
sound source rarefaction	wavelength equilibrium	compression
bard ed glass paper	plastic wrap plymood construction paper	aluminum foil window glass wax peper
	(S	vervet muddy water sheer fabric
(U)		
atch each term in	The word box above to its description.	
atch each term in	the word box above to its description This describes where the pressure r	returns to its rest position.
atch each term in	This describes the part of a pressure rare far apart.	returns to its rest position.
atch each term in	This describes where the pressure of a p	returns to its rest position. re wave where the vibrating particles ation.

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	Date Date
	Wave Velocity
Vave velocities te econd. Use the fo	Il the direction and speed of a wave. Wave velocities are measured in meters per formula in the example box to calculate the wave velocities.
d harmful to	Velocity = wavelength x frequency
A wave h 3.4 mete	nas a frequency of 2.5 hertz. The wavelength of the sound produced is rs. What is the velocity of the wave?
	meters per second
A tuning 1.5 mete	fork has a frequency of 280 hertz. The wavelength of the sound produced is rs. What is the velocity of the wave?
	meters per second
A wave h 5.7 mete	nas a frequency of 135 hertz. The wavelength of the sound produced is rs. What is the velocity of the wave?
	meters per second
A tuning 4.2 mete	fork has a frequency of 220 hertz. The wavelength of the sound produced is rs. What is the velocity of the wave?
	meters per second

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Unit 2.14 Handout 2

TEAC	CHER ANSWER KEY:		Page	2		
		Transver	se Wav	e	Longitudinal Wo	ave
	Moves matter direction of the	perpendicu e wave	ular to tl	ne	displace matte that the wave	er in the same direction is traveling
	water wave, e	arthquake	s-waves	5	sound waves,	earthquake p-waves
	high points are	crests, low	points [.]	troughs	high density areas are compression low density areas are rarefaction	
Page	e 3	Diag	gram o	of a So	und Wave	
1.	sound source		2.	compr	ression	
3.	rarefaction		4.	wavele	ength	
5.	equilibrium		6.	equilib	rium	
7.	rarefaction		8.	sound	source	
9.	compression		10.	Wavel	ength	
Page	e 4	Diag	gram o	of a Wo	ave	
1.	equilibrium		2.	amplit	ude	
3.	wavelength		4.	trough		
5.	crest		6.	wavele	ength	
7.	trough		8.	crest		
9	amplitude		10.	equilib	rium	
Page	e 5	Way	ve Velo	ocity		
1.	8.5	2.	420			
3.	769.5	4.	924			
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Unit 2.14 Handout 3

ANSWER KEY

- 1. a. B (broad)
 - b. N (narrow)
 - c. M (main)
- 2. c
- 3. b
- 4. d
- 5. a
- 6. b