Senior High School

DepED
DEPARTMENT OF EDUCATION

Lesson Exemplar in General Science

Quarter 1

Lesson Exemplar

9

Lesson Exemplar for General Science
Quarter 1: Unit 1

Development Team

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Republic of the Philippines
Department of Education
BUREAU OF LEARNING DELIVERY

LESSON EXEMPLAR			
Learning Area	General Science	**Grade Level**	11
Semester	First	**Quarter**	First

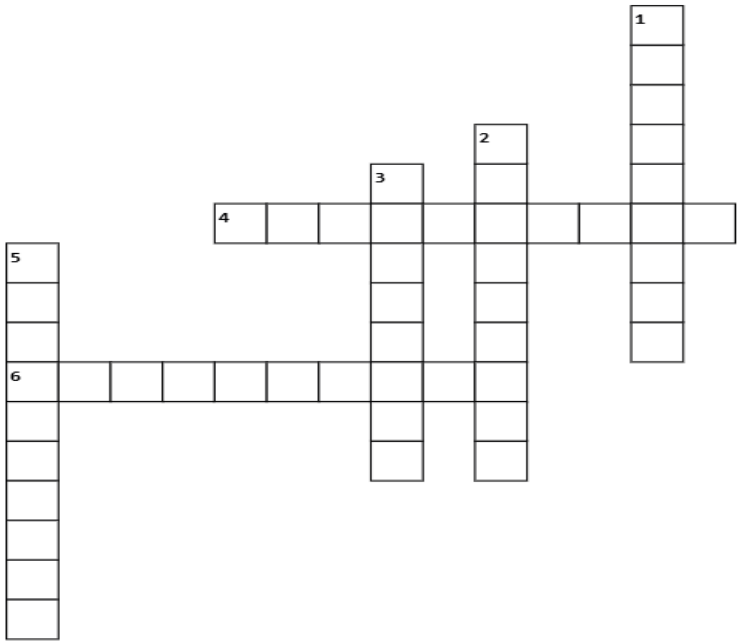
I. OBJECTIVES *(Identifying the Goals)*	
Content Standard	The students learn an understanding of the properties of light and sound leads to their safe and productive application.
Performance Standard	By the end of the quarter, learners identify general physics principles and their applications in daily life. They use scientific principles to solve problems, make informed decisions, and illustrate the applications of physics for self, society, and the environment. They design simple and compound machines and hydraulic systems to demonstrate applications of force, torque, center of mass, and hydraulic-related principles. They evaluate energy-efficient practices in electricity supply and consumption at home, in local businesses and in exploring advantages and drawbacks of light and sound in medical imaging, security, communication and entertainment.
Learning Competencies	Discuss properties of light and sound waves related to communications technology, navigation, medicine, and entertainment.
II. REFERENCES and MATERIALS	References: ✓ Review of *How Fiber Optics Work*. VirtualBrain [ENG]. December 27, 2024. https://www.youtube.com/watch?v=zAVsTubdd_Q. ✓ Review of *Https://Www.youtube.com/Watch?V=LxAQeFeC_Ew*. 2024. History of Simple Things. November 24, 2024. https://www.youtube.com/watch?v=LxAQeFeC_Ew.

	✓ Review of *Ultrasound Explained: How Does It Work?* 2023. Siemens Healthineers. June 21, 2023. https://www.youtube.com/watch?v=_e_OTXuHpnc. Materials: ✓ mobile phones ✓ writing materials
III. CONTENT	Understanding and using light and sound
IV. OBJECTIVES	1. Describe the different properties of light and sound waves. 2. Examine how light and sound waves properties are applied in communications technology, navigation, medicine and entertainment. 3. Recognize the importance of the application of the properties of light and sound in daily life.

IV. PROCEDURES	**ANNOTATION**
A. Activating Prior Knowledge	1. Activating Prior Knowledge ***Option 1: Identify it!*** *Directions: Identify what is being described in each statement. Choose your answer from the box below.* _____1. The phenomenon where light bounces off a surface and changes direction. _____2. It is the bending of light rays as they pass from one medium to another.	*The teacher identifies the prior knowledge of the learners about the properties of light and sound which are already introduced on their previous levels as a springboard to the presentation of the lesson.* *After unlocking the ideas, the teacher may discuss briefly the different properties of light and sound to enhance learning. Emphasize that both sound and light possess the same*

	_____3. It is the distance between two consecutive points in phase on the wave. _____4. The height of a wave which is measured from its equilibrium position. _____5. It refers to the number of cycles or oscillations a sound wave completes in one second. _____6. It refers to the distance a wave travels through a medium in a given time. amplitude frequency reflection refraction speed wavelength	*properties used in the activities, but have different numerical values.* **Properties of Light** *Light is an electromagnetic wave, which means it can travel through vacuum. Its key properties include:* *1. Speed* • *Light travels at ~300,000 km/s (3×10^8 m/s) in a vacuum* • *Slower in materials like glass or water* *2. Wavelength (λ)* • *Distance between two consecutive peaks or troughs.* • *Determines color in visible light:* ○ *Violet ≈ 400 nm* ○ *Red ≈ 700 nm* *3. Frequency (f)* • *Number of wave cycles per second (Hz)* • *Higher frequency = more energy* • *Frequency × Wavelength = Speed of Light ($c = f \times \lambda$)* *4. Reflection* • *Light bounces off a surface* • *Angle of incidence = angle of reflection*

Option 2: Light and Sound Puzzle



Across

4. It is the distance between two consecutive points in phase on the wave.

6. The phenomenon where light bounces off a surface and changes direction.

5. Refraction
- *Light bends when passing from one medium to another (e.g., air to water)*
- *Caused by a change in speed*

6. Diffraction
- *Bending of light around obstacles or through small openings*

7. Interference
- *When two light waves meet, they can combine (constructive) or cancel out (destructive)*

8. Polarization
- *Light waves normally vibrate in all directions perpendicular to their path.*
- *Polarization filters allow waves vibrating in only one direction*

9. Dispersion
- *Splitting of white light into its colors (e.g., in a prism)*
- *Happens because different wavelengths refract at different angles*

Properties of Sound

Sound is a mechanical wave that requires a medium (like air, water, or solids) to travel. Its key properties include:

1. *Frequency (Hz)*
   - *Number of vibrations per second.*

Down

1. The height of a wave which is measured from its equilibrium position.

2. It refers to the number of cycles or oscillations a sound wave completes in one second.

3. It refers to the distance a wave travels through a medium in a given time.

5.It is the bending of light rays as they pass from one medium to another.

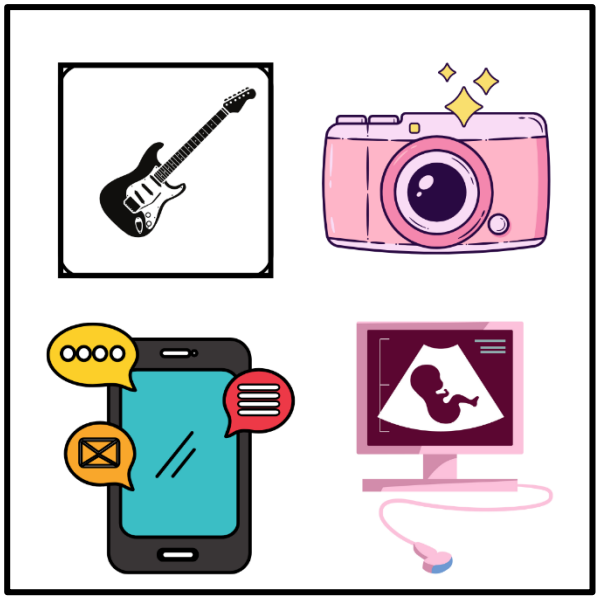
Option 3: Pick it up!

Directions: From the list of words in the box below, pick up one word then describe it.

amplitude	frequency
reflection	refraction
speed	wavelength

- *Human hearing range: 20 Hz to 20,000 Hz.*
- *Low frequency = bass; high frequency = treble*

2. *Wavelength (λ)*
   - *Distance between two successive compressions or rarefactions*
   - *Inversely proportional to frequency*
3. *Amplitude*
   - *Height of the wave; relates to loudness*
   - *Greater amplitude = louder sound*
4. *Speed*
   - *Depends on the medium*
     - *Air (~343 m/s at 20°C)*
     - *Water (~1500 m/s)*
     - *Steel (~5000 m/s)*
5. *Pitch*
   - *Perception of frequency*
   - *Higher frequency = higher pitch*
6. *Loudness*
   - *Perception of amplitude.*
   - *Measured in decibels (dB)*
7. *Timbre (Quality)*
   - *Distinguishes different sources of sound (e.g., violin vs. piano)*

	2. Establishing the Purpose of the Lesson ***Option 1. 4-Pics-in-1-Concept***  *Directions: Interpret the diagram above showing 4 pictures by answering the questions below:* *Guide Questions:* *1. What are being shown in the pictures?*	*This part makes the lesson **integrative,** since different concepts from different fields are being organized in one diagram. It also makes the lesson **relevant** to the students because they encounter what is being shown in the diagram.* *Note:* *The teacher could create other diagram from what is being shown to personalize more the learning of the students. Replacing the diagram with pictures more relatable to the learners will help them see the relevance of the lesson in their daily lives.*

2. What are the physics concepts related to the pictures?

3. In what fields are these technologies related to?

Option 2. Complete it!

Directions: Complete the table below by listing down at least three technologies/techniques/methods in each category that are related to light and/or sound:

Communication	***Navigation***	***Medicine***	***Entertainment***
1. Cellphone	*1.*	*1.*	*1.*
2.	*2.*	*2.*	*2.*
3.	*3.*	*3.*	*3.*

Option 3. Classify it!

Directions: Classify the words on the box whether they are related to the fields of communication, navigation, medicine or entertainment. Write them on the corresponding column.

Lasers	Sonar	Fiber optics
Cellphone	Ultrasound	Satellite
Hologram	LEDs	Phototherapy
3D glasses		

	<table><tr><th>***Communication***</th><th>***Navigation***</th><th>***Medicine***</th><th>***Entertainment***</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>	*Note:* *Light considering it as an electromagnetic wave, has also many applications in various fields like the Global Positioning System (GPS) which is very useful in navigation.*
B. Instituting New Knowledge	1. Presenting Examples ***Option 1: How Fiber Optics Work*** The students will watch a video entitled "**How Fiber Optics Work".** *Source:* Scan me! Guide Questions: 1. What are the different properties of light mentioned in the video?	*This part makes the lesson relevant to the students since the examples demonstrated in the videos are being encountered by the students in almost of their everyday loves.* *In the processing of guide questions on "How Fiber Optics work, the teacher may emphasize the different properties of light involved in fiber optics being used in modern communication, namely:* ✓ *Reflection* ✓ *Refraction* ✓ *Total Internal Reflection*

	2. Why are fiber optics cables preferred to be used in modern communication? 3. How does fiber optics work? ***Option 2: Ultrasound*** The students will watch a video entitled "Ultrasound explained: how does it work?" *Source:* Scan me!	*The teacher may present the following steps on how fiber optics work in a random manner and let the students arrange them:* *1. Laser or LED Source sends data as pulses of light into the fiber.* *2. Light pulses travel through the core, bouncing off the cladding.* *3. Receiver at the other end detects the light pulses.* *4. Electronics decode the pulses back into data (like internet, phone, or video signals).*

	Guide Questions: 1. What is ultrasound? 2. How is an ultrasound image formed? 3. How is ultrasound used today? 4. What are the advantages of ultrasound? ***Option 3: SONAR*** *The students will watch a video entitled "**How SONAR works | How it works**"* *Source:* Scan me! Guide Questions: 1. What does the word SONAR stand for? 2. What property of sound wave is involved in sonar?	

	3. Illustrate how sonar works in marine exploration. 2. Discussing New Concept Both light and sound waves, which are types of energy, demonstrate unique characteristics that have transformed numerous domains. Light is essential in communication, navigation, medicine, and entertainment because of its quickness, capacity to move through a vacuum, and engagement with matter. In contrast, sound waves are utilized for communication, navigation (such as in sonar), and entertainment (like music) because they can move through different mediums. Topic 1: Properties of Light and its Applications to Communication, Navigation, Medicine and Entertainment Topic 2: Properties of Sound and its Applications to Communication, Navigation, Medicine and Entertainment 3. Developing Mastery **Option 1.** Complete the table below on how does the properties of light and sound waves are being applied in the following fields: **Communication** | **Navigation** | **Medicine** | **Entertainment** | | | |	*This part makes the lesson **responsive**, since the materials to be used are simple and readily available so the students could visualize the properties of light and sound though an experiment. This part also makes the lesson relevant, since the topics are applicable to the students' daily lives.* *In this part, **integration** of ideas and concepts from different fields is emphasized.*

	Option 2. Describe how the properties of light and/or sound waves play an important role in the following situations: 1. Communication using cellular phones 2. Radio Broadcasting 3. Checking fetal development and health 4. Locating objects underwater 5. Seafloor Mapping 6. Using 3D glasses in watching movies 7. Diagnosing diseases through ultrasound 8. Communication through internet 9. Production of music 10. Production of movies ***Option 3.*** Create an infographic showing the application of the properties of light and sound in the fields of communication, navigation, medicine and entertainment.	*Note:* *The teacher could ask the students use online or offline apps in creating the infographic using laptops or mobile phones. In case gadgets are not available, manual illustration using writing materials and bond paper could do.*

How to score:

CRITERION	***RATING***			
	4	***3***	***2***	***1***
Accuracy of Content	*The content included in the diagram is 100% accurate.*	*At least 90% of the content included in the diagram is accurate*	*At least 75% of the content included in the diagram is accurate*	*Less than 75% of the content included in the diagram is accurate*
Creativity	*The diagram shows high creativity.*	*The diagram shows moderate creativity.*	*The diagram shows low creativity.*	*The diagram shows no creativity.*
Appearance	*The diagram is very appealing in terms of design, layout, and neatness.*	*The diagram is appealing in terms of design, layout, and neatness.*	*Some elements of the diagram are appealing in terms of design, layout, and neatness.*	*The diagram is not appealing in terms of design, layout, and neatness.*

C. Demonstrating Knowledge and Skills

1.Finding Practical Application

Option 1. Choose one field among the discussed various domains where the properties of light and sound waves are being applied. Think of a situation where you have experienced using these concepts.

	Option 2. Answer the following question: How does the application of properties of light and sound waves affect your daily life? **Option 3.** How does the property of light and sound are applied for your safety in the road? 2. Making Generalization **Option 1.** Create your own hashtag implying the importance of light and sound in your daily life. **Option 2.** Create your own tagline implying the importance of light and sound in your daily life. **Option 3.** Create your own slogan implying the importance of light and sound in your daily life. 3. Evaluating Learning **Option 1. Exit Ticket Assessment 1** The teacher may ask the following questions to the students: 1. What was the most important thing you learned today? 2. How does the concepts connect to something you learned and experienced before? 3. What is one thing you would like me to discuss more? **Option 2: Exit Ticket Assessment 2** The teacher may ask the following questions to the students: 1. What are the three concepts you learned today? 2. What are the two concepts you are more relatable?	*This part makes the lesson reflective where students assess their own learning and convey it to the teacher by answering the posted questions. The feedbacks will help the teacher identify points to strengthen in the lesson, thus, continuous improvement is being catered.*

	3. What is one concept you want to know more? **Option 3: Exit Ticket Assessment 3** 1. How do you feel about the topics/concepts discussed? Put a check mark on the corresponding column: I understood the topics well | I understood some topics | I need more help | | | 2. Can you provide some details supporting your answer? _____ _____. 4. Additional Activities **Option 1. Search it up!** Students choose a specific technology related to light or sound waves and create a detailed report or presentation on its science and applications. **Option 2. Review** Generate a brief review of an event (like concerts, theatrical plays, films, etc.) highlighting the impact of light and sound waves on its production.	*This part helps the lesson become research-based. Since students will still search for other technologies related to sound and light.*

	Option 3. Dangers Alert Search on the drawbacks on the application of properties of light and sound on the different fields.	*This part makes the learners become aware of their safety with the different technologies and techniques that uses the properties of light and sound.*
V. ASSESSMENT	**Option 1. Multiple Choice** Directions: Choose the letter of the best answer. Write your answer on the space provided before each number. _____1. What property of sound is responsible for producing music from instruments like guitars and drums? A. Frequency B. Vibration C. Echo D. Resonance _____2. What is a common medical use of high-frequency sound waves? A. Laser surgery C. MRI scans B. Ultrasound imaging D. Phototherapy _____3. Which of the following system uses sound in navigation? A. Mapping B. Echolocation C. Sonar D. Laser _____4. In what field is sound applied when a siren warns people of danger? A. Entertainment C. Medicine B. Communication D. Safety _____5. Which property of light enables fast internet via fiber-optic cables? A. Laser light C. Polarization B. Speed of light D. Dispersion _____6. What is the principle behind how light is completely reflected inside fiber optic cables? A. Polarization C. Reflection	

B. Total Internal Reflection D. Refraction

_____7. What kind of wave is used in ultrasound imaging to view internal organs?
A. Light wave C. Low-frequency sound wave
B. Infrared wave D. High-frequency sound wave

_____8. What is one reason sound waves are not used for communication in space?
A. They are too fast
B. They cannot be modulated
C. They require a medium to travel
D. They interfere with radio waves

_____9. Which light-based technology is used in medical procedures like eye surgery and skin treatments?
A. Laser C. Fluorescent lamps
B. Polarizing lenses D. Infrared thermometers

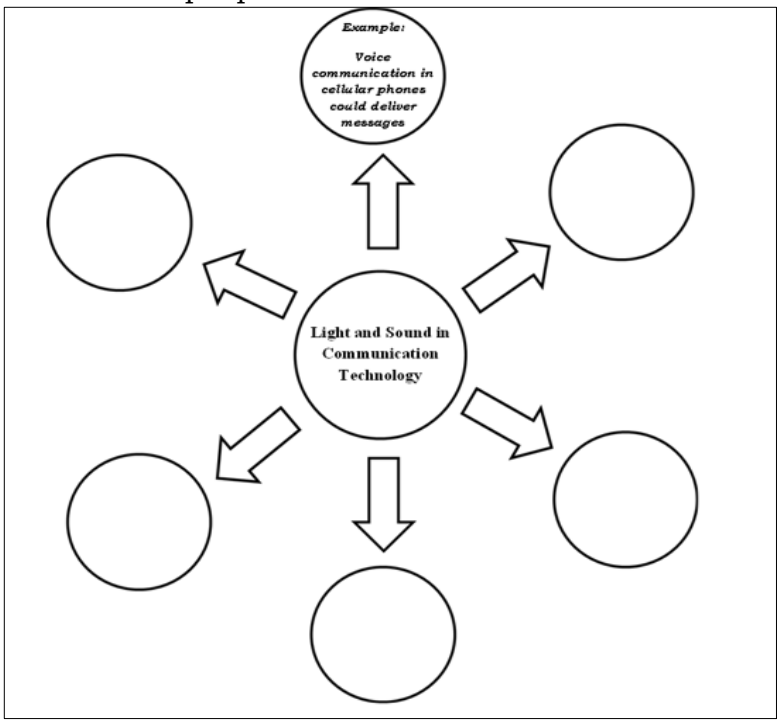
_____10. In entertainment systems, surround sound relies on what property of sound?
A. Speed C. Polarization
B. Frequency D. Reflection and direction

Option 2. Describe the important role of light and sound wave in the following situations:

Situation	Role of Light and/or Sound
1. Optical Fiber communication	
2. Medical imaging using ultrasound	

3. Ship navigation using sonar	
4. Musical concert production	

Option 3. Create a bubble map by identifying the importance of light and sound waves in the various fields that could affect one's everyday life. See the sample provided.



VI. REFLECTION	Teachers can take note tasks that will be continued the next day or additional activities needed. They are also encouraged to record relevant observations or any critical teaching events that influence on the attainment of the lesson objectives.

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APPENDIX

Key to Correction

Assessment : Multiple Choice

Correct Answer	Rationalization
Vibration	l is produced when an object vibrates, creating pressure waves in the air that our ears interpret as sound. In musical instruments like guitars and drums, it's the vibration of strings or drumheads that produces sound.
Ultrasound imaging	frequency sound waves are used in ultrasound imaging, a common medical technique for visualizing internal organs, monitoring pregnancies, and diagnosing conditions.
Sonar	(Sound Navigation and Ranging) is a system that uses sound waves to detect and locate objects underwater. It works by emitting sound pulses and measuring the time it takes for the echoes to return after bouncing off objects.
Safety	n uses sound to warn people of danger, such as during fires, storms, or emergencies.

5. B. Speed of light	Fiber-optic cables transmit data using light signals. The speed of light in these cables allows data to travel extremely fast over long distances, making high-speed internet possible.
6. B. Total Internal Reflection	Total Internal Reflection is the principle that allows light to be completely reflected within fiber-optic cables without escaping.
7. D. High-frequency sound wave	Ultrasound imaging uses high-frequency sound waves (typically above 20,000 Hz) to create images of internal organs.
8. C. They require a medium to travel	Sound waves need a medium (like air, water, or solids) to travel.
9. A. Laser	Laser is used in many medical procedures, including eye surgery, skin treatments, and even tumor removal.
10. D. Reflection and direction	Surround sound systems use the reflection and direction of sound to create an immersive audio experience.