

Focused Learning Lesson
Physical Science
Grade Levels 9 – 12
PS-H-G4

Overview:

This lesson provides students the opportunity to study positive and negative aspects of various types of energy through critical thinking and cooperative-learning activities.

Approximate Duration: two 45-minute class periods

Benchmark:

PS-H-G4 explaining the possible hazards of exposure to various forms and amounts of energy

PS GLE: 50. Identify positive and negative effects of electromagnetic/mechanical waves on humans and human activities (e.g., sound, ultraviolet rays, X-rays, MRIs, fiber optics).

Benchmark:

SI-H-A2 designing and conducting scientific investigations

SI GLE: 2. Describe how investigations can be observation, description, literature survey, classification, or experimentation.

Objectives:

1. Identify positive and negative effects of various types of energy.

Teacher Preparation: See *Teacher Background* found in Attachment 1.

Materials:

- Attachment 3 – Positive and Negative Aspects of Various Forms of Energy chart
- 3” x 5” index cards, enough for each student to have at least two cards

Lesson Procedures:

Set Induction: (5 minutes)

Students brainstorm positive and negative aspects of various forms of energy. Place students in cooperative groups of four. Each cooperative group receives a copy of Attachment 2, Positive and Negative Aspects of Various Forms of Energy. Students refer to definitions on chalkboard (*refer to Teacher Background*) as they brainstorm positive and negative aspects. Teacher should encourage students to write at least one positive and one negative aspect for each type of energy listed. After students have completed their lists in cooperative pairs, have students share some of their thoughts through whole class discussion.

Body of the Lesson:

1. Assign each cooperative group one of the following topics: sound, ultraviolet rays, x-rays, MRI, or fiber optics. Have student groups research the assigned topic. Refer to Attachment 2 for directions.
2. Divide the class to form groups.
3. Implement the activity, *Send a Problem*. Refer to Attachment 3 for directions.

Closure:

Provide each student with a blank copy of Attachment 2. Students individually complete the concept map.

Attachments:

Attachment 1: Teacher Background

Attachment 2: Send A Problem

Attachment 3: Positive and Negative Aspects of Various Forms of Energy

Assessment:

Teacher observation is used for formative assessment.

Completion of Attachment 3 during closure is used for summative assessment.

Reference Links:

Blaz, D. (1998). *Teaching Foreign Languages in the Block*, 112-113.

Attachment 1 Teacher Background

Definitions:

Sound is energy that travels in the form of compression waves (vibrations). Mechanical energy is often converted to sound energy.

Thermal energy is the total kinetic energy contained in all particles of a substance. This form of energy is measured as temperature. The term heat indicates the transfer of thermal energy from one substance to another.

Electrical energy results from the attractive or repulsive forces between charged particles. Current electricity is a continuous flow of electrical charges.

Chemical energy is the energy in chemical bonds. It is released when chemical bonds are broken. Fuel such as gasoline, natural gas, food, and rocket fuels contain chemical energy. The energy in sugar molecules is used to maintain your body's metabolism.

Nuclear energy is the energy contained in the nucleus of an atom. It is released through nuclear fission and nuclear fusion.

Electromagnetic energy is energy in the form of waves that travel through empty space as well as through matter. The electromagnetic spectrum includes visible light, radio waves, microwaves, infrared and ultraviolet light, X-rays and gamma rays.

Ultraviolet Radiation is a short wavelength form of electromagnetic energy produced by the sun.

X-ray is electromagnetic energy that can penetrate soft tissues.

Gamma rays are a form of electromagnetic energy produced when the nucleus of an atom gives up energy.

Mechanical energy is energy associated with motion. Mechanical energy is found in moving water (waterfalls), wind, walking, riding a bike, and any device that has moving parts such as a motor.

Sound (Music)

Could it be possible that music could have unrecognized effects, both harmful and beneficial?

The effects of music have been recognized since the ancient Greeks and Romans. Plato, Cicero, and Seneca all believed that music profoundly affected the behavior of entire societies and that the state should regulate the performance of music and prohibit certain types because of their potentially harmful effects.

It is said that music is beneficial during pregnancy and childbirth, i.e., listening to the music of Mozart. Some scientists suggest that listening to classical music improves concentration.

People learn through the arts, which include music, and their minds grow because of that experience. Music, when used appropriately, can have positive effects on a child's learning and help them in many ways. One way music may be helpful is by increasing the speed at which children learn. Some music, when implemented properly, may have positive effects on learning, attitude, character, and feeling.

Music may have a positive effect on a person's attitude. Listening to music as background can help some people while they are thinking, learning, or working. For this to be effective, the music needs to be chosen correctly. The tempo, speed of the music, volume, and consonance of the selection should be carefully considered. A piece that is too fast and too loud will likely make the students anxious and want to move around excessively. A piece that is too slow and soft will likely make the students lethargic. If the music choice is extreme in its characteristics, it may likely prove distracting and thus make it hard for students to learn or think.

Note: A music educator or musician may be utilized to select appropriate examples.

Sound - Noise Pollution

Any form of unwelcome sound is noise pollution, whether it is the roar of a jet plane overhead or the sound of a barking dog a block away. Can music be considered noise pollution?

The definition of noise itself is highly subjective. To some people the roar of an engine is satisfying or thrilling; to others it is an annoyance. Loud music may be enjoyable or a torment, depending on the listener and the circumstances.

One way to determine if something is a pollutant is to determine the danger it poses to health. Noise causes stress, and stress is a leading cause of illness. Any form of noise can be considered pollution if it causes any stressful reaction. The actual loudness of a sound is only one component of the effect it has on human beings. Other factors that have to be considered are time, place, source, and duration of the sound. Most people would not be bothered by the sound of a 21-gun salute on a special occasion. On the other hand, the sound of a neighbor's music at 2:00 AM, even if barely audible, could be a major source of stress.

Encyclopedia Article from Encarta on Noise Pollution

<http://encarta.msn.com/encnet/refpages/RefArticle.aspx?refid=761586561>

Ultraviolet Radiation

Ultraviolet radiation is a part of the electromagnetic spectrum. The sun produces UV, mostly absorbed by ozone, although some reaches the Earth. Ultraviolet radiation comes in three forms – UV-A, UV-B, and UV-C.

Overexposure to the sun's ultraviolet radiation can cause sunburn and long-term problems such as skin cancer and cataracts. One effect of long-term sun exposure is the premature aging of the skin due to all three forms of ultraviolet radiation. Even careful tanning kills skin cells, damages DNA and causes permanent changes in skin connective tissue that leads to wrinkle formation in later life. There is no such thing as a safe tan.

DNA absorbs UV-B light. The absorbed energy can break bonds in the DNA. The cell repairs most DNA breaks, but unrepaired genetic damage of DNA can lead to skin cancers. The principle danger of skin cancer is to people with light-colored skin.

A patient is sometimes deliberately exposed to UV radiation in order to either diagnose or treat a medical condition. In diagnosis situations, doctors use UV radiation to identify the presence of various fungal and bacterial infectious agents on the skin.

UV radiation is used to treat skin conditions such as psoriasis. Babies with jaundice are exposed to UV radiation to aid in clearing up the problem. Dentists use UV radiation while working on certain problems with teeth.

Fiber optics is the use of thin transparent fibers of glass or plastic to transmit data, voice, and images

Magnetic resonance imaging (MRI) is a technique that produces computerized images of internal body tissues caused by the application of radio waves.

Attachment 2

Send A Problem

On day one, have students conduct their research through books, computer software, or the Internet. The teacher or student should copy the reading material selected by each group for each student in the class for day two.

On day two, each student in a group writes two (*or more*) questions on the selected reading. Each question is written on the front of an index card.

Group Members:

Student 1: Write two questions about the positive aspects of the topic assigned to your group.

Student 2: Write two questions about the negative aspects of the topic assigned to your group.

Student 3: Write two questions about interesting facts concerning the topic assigned to your group.

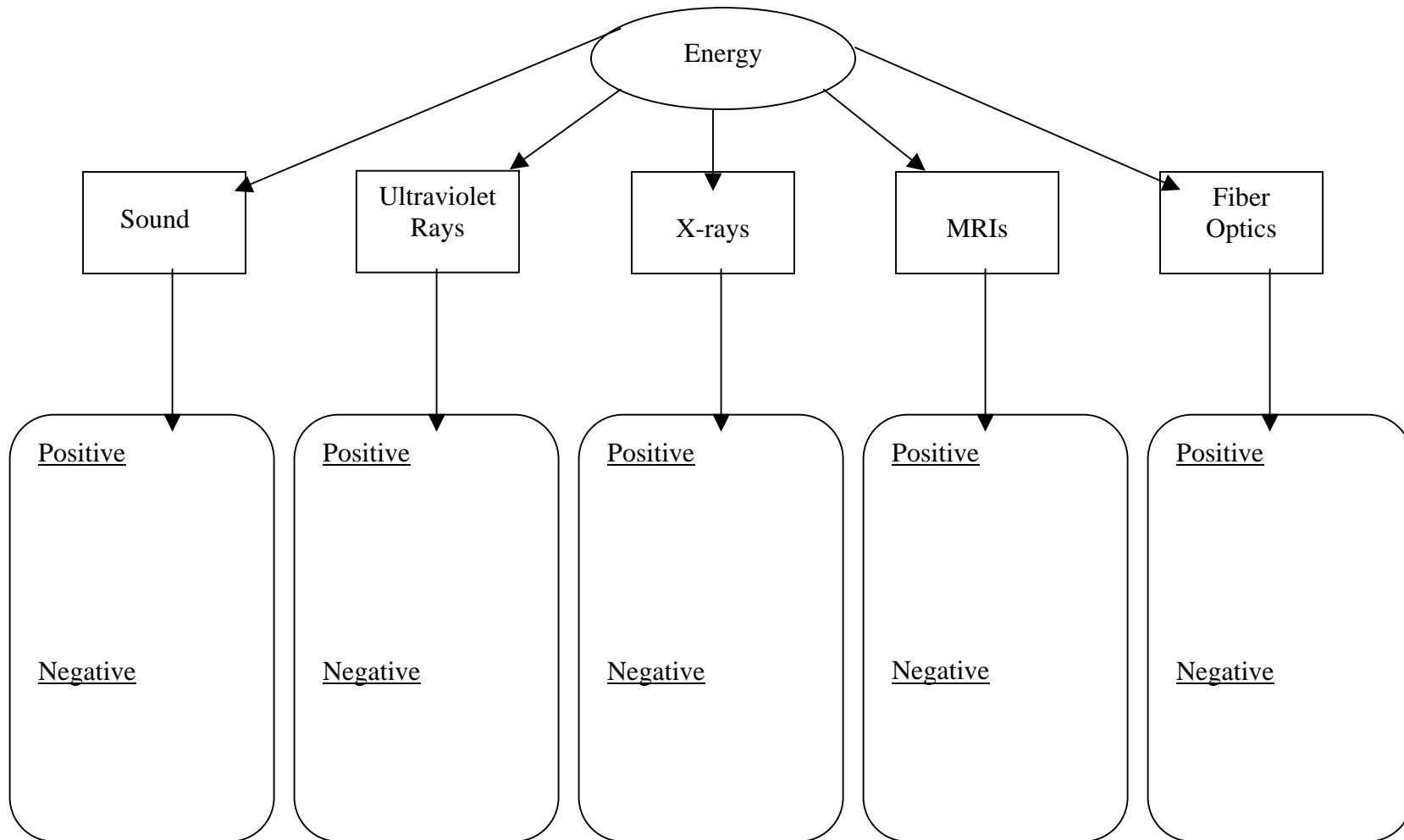
Student 4: Write two questions about interesting facts concerning the topic assigned to your group.

Once questions are written, the student asks his or question to his group members. Group members read the text to determine the answer. If the group agrees on the answer, then the student writes the answer on the back of the index card. If the group cannot reach consensus, then the student must rewrite the question.

Students should place a Q at the top right hand corner of the question side of the index card and an A at the top right hand corner of the answer side of the index card.

Once all groups have completed the assignment, reading material and index cards are passed to another group, Q side up. When a group receives another group's questions, the first student takes the top question and reads it. Students go through the reading material to find the answer. The group discusses the answer and then flips the card over to determine if they have the correct answer. If they are correct, then they should congratulate each other and move on to the next question. If a problem occurs with students thinking answers are incorrect, the teacher verifies the answer. Groups continue to send reading material and questions around until each group gets its original questions back.

Attachment 3
Positive and Negative Aspects of Various Forms of Energy or Energy Technology



Attachment 3
Positive and Negative Aspects of Various Forms of Energy

