Types of waves and properties worksheet

The main characteristics (parts) of the wave include: frequency, amplitude, wavelength and speed. FrequencyFrequency is a measure of how many waves pass through a point over a certain period of time. The higher the frequency, the closer the waves are together and the higher the energy carried by the waves. AmplitudeAmplituud is the measure of distance between the line through the middle of the wave and the brush or trough. The greater the wavering force, the greater the amplitude of the wave and the greater the wave gas. The highest point of the transverse wave is the crest and the lowest point is called a trough. In the transverse wave, the higher the wave, the greater the amplitude. Sounds with a higher amplitude are louder; with a slight higher amplitude is lighter. Wavelength Wavelength is the distance distance from the crest on one wave brush on the very next wave. Shorter wavelengths are influenced by frequency. Higher frequency causes shorter wavelengths and higher energy. SpeedSpeed is a measure of the distance the wave moves over time. The velocity of the wave shall be determined by the type of wave and the carrier nature. When a wave enters another medium, the speed of the wave changes. The waves move at different speeds in different media. All electromagnetic waves are moving at the same speed in an empty room. Find out how to calculate the speed of a wave or how to chart these features on a longitudinal wave. Grade Level: 8 (8-10) Time Required: 1 hours 45 minutes (two 50-minute periods; may be over two days) Lesson Addiction: None subject areas: Biology, Physics, Science and Technology Students learn the types of waves and how they change directions, as well as basic wave characteristics such as wavelength, frequency, amplitude and speed. During lectures on wave characteristics and characteristics, students take handout notes. They then mark the wave parts in the worksheet chart and draw their waves with specified characteristics (brush, trough, and wavelength). They also make observations about the waves they drew to determine which one has the highest and lowest frequency. With this knowledge, students understand the waves better and are a step closer to understanding how people see color. This engineering curriculum is in line with next generation scientific standards (NGSS). Engineers apply their knowledge of the waves to design a myriad of useful products and tools, many of which are evident in our daily lives. For example: microwave ovens, X-ray machines, glasses, tsunami prediction, radios and speakers. Engineers need to understand all the characteristics of waves and how waves can differ from each other in order to design safe and efficient products. To predict how tsunamis will travel after an ocean earthquake, engineers need to understand wave characteristics how they travel. Engineers also use their understanding of wave properties to separate different types of waves from electronics, so that radios tune to the right stations, or so a mobile phone only takes the desired calls. Before developing a solution to the challenge, engineers carry out research and collect information as an important part of the engineering design process. Through this legacy cycle lesson, students begin to gather the knowledge necessary to find a solution to the 1st lesson in this unit. After this lesson, students should be able to: explain that waves carry energy, not matter. Distinguish between mechanical and electromagnetic waves. Summarize the main characteristics and behaviours of the waves, including, but not limited to, wavelength, frequency, amplitude, speed, breakage, reflections and diffraction. NGSS performance expectation MS-PS4-1. Use mathematical representations to describe simple waves that include how the amplitude of the wave is associated with the energy in the wave. (grades 6 to 8) Do you agree with this alignment? Thanks for the feedback! Click to view other curriculum aligned with this Performance Expectations This lesson focuses on the following three-dimensional learning aspects of NGSS: Science & Engineering Practices Disciplinary Core Ideas Cross-Cutting Concepts Use Mathematical Presentations to describe and/or support scientific conclusions and design solutions. Alignment agreement: Thanks for the feedback! Scientific knowledge is based on logical and conceptual links between evidence and explanations. Alignment agreement: Thanks for the feedback! A simple wave is a repeating pattern with a specific wavelength, frequency and amplitude. Alignment agreement: Thanks for the feedback! Graphs and charts can be used to detect data patterns. Alignment agreement: Thanks for the feedback! NGSS performance expectation MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed or transmitted through different materials. (grades 6 to 8) Do you agree with this alignment? Thanks for the feedback! Click to view other curriculum aligned with this Performance Expectations This lesson focuses on the following three-dimensional learning aspects of NGSS: Science & Engineering Practices Disciplinary Core Ideas Cross-Cutting Concepts Compiled, which includes qualitative or quantitative links between variables that describe phenomena. Alignment agreement: Thanks for the feedback! The sound wave needs the medium through which it is transmitted. Alignment agreement: Thanks for the feedback! When an object shines, is reflected, absorbed or transmitted through an object, depending on the material of the object and the frequency (color) of the light. Alignment agreement: Thanks for the feedback! The path that light moves can used as straight lines, except between different transparent materials (e.g. air and water, air and glass) where the light path bends. Alignment agreement: Thanks for the feedback! Wave model light is useful to explain the brightness, color and frequency-dependent bending of light on the surface between the media. Alignment agreement: Thanks for the feedback! However, because light can travel through space, it cannot be a wave of matter, such as sound or water waves. Alignment agreement: Thanks for the feedback! Structures can be designed to perform certain functions, taking into account the characteristics of different materials and how materials can be designed and used. Alignment agreement: Thanks for the feedback! Students develop an understanding of the relationship between technologies and the relationship between technology and other fields of learning. (Grades K - 12) For more details See aligned curriculum Do you agree with this alignment? Thanks for the feedback! Waves (including sound and seismic waves, waves in water and light waves) are energy and transfer energy when they interact with matter. Waves are a repetitive movement pattern that carries energy from one place to a place without the overall displacement of the substance. All types of waves have some features in common. When the waves communicate, they superficial or disturb each other resulting in changes in amplitude. The main modern technologies are based on waves and their interactions with matter. (Step 8) For more details See the aligned curriculum Do you agree with this alignment? Thanks for the feedback! The student shows an understanding of the characteristics and behavior of the waves. (Step 8) For more details See the aligned curriculum Do you agree with this alignment? Thanks for the feedback! Summarize factors that affect the main characteristics of waves (including frequency, amplitude, wavelength, and speed). (Step 8) For more details See the aligned curriculum Do you agree with this alignment? Thanks for the feedback! Summarize the behaviour of the waves (including refrafractive, reflection, transmission, and absorption). (Step 8) For more details See the aligned curriculum Do you agree with this alignment? Thanks for the feedback! Suggest Alignment Is Not Listed Above Waves and Wave Features Presentation (ppt) Waves and Wave Features Presentation (pdf) All About Waves-Notes Outline (docx) All About Waves—Notes Outline (pdf) All About Waves—Notes Outline (Pdf) All About Waves—Notes Outline Answers docx) All About Waves —Notes Outline Responses (pdf) Anatomy wave worksheet (doc) anatomy wave worksheet (pdf) Anatomy Wave Worksheet Responses (doc) Anatomy on Wave Worksheet Replies (pdf) Visit [www.teachengineering.org/lessons/view/clem_waves_lesson02] to print or download. (Make advance copies of all about waves– Notes Outline and Anatomy (All About Waves) and make a graph available to students. Also [optional], prepare to show students included in the 16-slide Waves and Wave Properties Presentation accompanied by a lesson introduction. Slides are animated so you can click to display the next item when they're ready.) Returning to our tricolor mystery, today we are developing an understanding of the basic concepts of waves. What we learn brings us one step closer to achieving our goal of creating a solution to our engineering challenge that I explained yesterday (lesson 1 for this unit). Let's start with what we already know. Why do we see? (Because there's light.) What is light? (This is a wave.) What's a wave? Well, we'll learn the answer to that question today! I pass out an overview that helps you track important concepts that are explained when we talk about waves and wave features. (At that moment, share your notes and provide the lecture material in the Background with slides section.) (Next, students can apply what they just learned, divide the class into groups of two students, and share copies of worksheets and blank graph paper.) Who ever tanned your skin? Who's used a microwave to make popcorn? Or was x-rays? Or listening to the radio? What do these activities have in common? (Listen to students' answers.) All of them require waves. One difference between the waves that pop popcorn and the waves that tan the skin is the wave frequency. As we have learned, wave frequency is defined as the number of cycles that pass through one point over a certain period of time. In the first part of the worksheet, mark the parts of the flow using these definitions. Then draw four different waves, giving you information about the characteristics of the waves. Of these four waves, your task is to identify those with the highest and lowest frequencies. Legacy Cycle Information: This lesson belongs to the research and watch stage of the legacy cycle. During this phase, students will learn the basic concepts necessary for the 1st form of this unit. After 2 May 2004, the Commission shall Ocean waves are mechanical waves. Waves and Wave Features (Next lecture material aligns with slides.) A wave is a disorder that carries energy from one place to another. Matter is not through the wave! The wave may move through the substance (called medium), but some waves do not require the medium to be able to move. If a wave needs a medium, we call it a mechanical wave. If a wave can travel without a medium (e.g. through space), we call it an electromagnetic wave. wave types transverse waves: waves where the average moves at right angles Think of the stadium wave: people are moving up and down, but the wave goes around the stadium. Transverse parts: Hari: highest point of the wave trough: the minimum point of the wave Compressed (longitudinally) waves: waves in which the average moves back and forth in the same direction as the wave. Parts of compression waves: Compression: when particles are close to Harvfaction: when particles are scattered, Wave properties depend on what (type of energy) makes to the wave. For example, spraying in the ocean or earthquakes that cause a tsunami. The descriptive wave characteristics are as follows: Wavelength: the distance between one point of the wave and the exact same spot of the next wave. Frequency: Multiple waves will go over the point in one second. The unit of measure is hertz (Hz). The higher the frequency, the more energy in the wave. When 10 waves go along in 1 second, it's 10 Hz When 1,000 waves go past 1 second, it's 1000Hz When 1,000,000 waves go by, it's 1,000,000 Hz Amplitude: How far the medium (crests and troughs, or compressions and rarefactions) moves from the resting position (the average place is, if not moving). The more energy the wave carries, the bigger its amplitude. Wave energy can be expressed by equation E = CA2, where E is energy, C is permanent, which depends on the average, and A is an amplitude. Wave speed: Depends on where the wave moves. It varies from solids, liquids and gases. The mathematical way to calculate wave speed is: wave rate = wavelength (m) x frequency (Hz). Or $v = f \times \lambda$. So, if the wave length is 2 m and the frequency is 500 Hz, what is its speed? (Answer: wave rate = 2 m x 500Hz = 1000 m/s) Change of direction Refraction demonstration. Reflection: When waves bounce from the surface. If the surface is flat, the angle at which the wave hits the surface is the same as the angle at which the wave comes out of the surface. In other words, the angle equals the angle. It's a law of reflection. (For example, if a pool ball hits a pool table, the angle of hitting the bumper is at the same angle at which it bounces off the bumper.) Refraction: Waves can bend. This happens when a wave enters a new environment and its speed changes. The amount of bending depends on the media you are inserted. (optional: To explain this phenomenon more in more detail, search the Internet for an interactive tutorial that indicates that light is bent as it moves through the media.) Diffraction: Bending waves around an object. The amount of bending depends on the size of the obstacle and the size of the waves. (optional: For more detailed explanation of this phenomenon, search the Internet for an interactive tutorial that shows the diffraction of monochromatic light through a slit of different widths.) Large resistance, low wavelength = low I can't believe you did this. Small obstacle, large wavelength = large diffraction (bending) Now that you're all experts that understand the different types of waves, how they move and change direction, and how to describe their properties, tell me what are some of the ways in which you see the waves used in your daily life? (Listen to students' ideas.) These are excellent examples. What about microwave ovens, medical and dental X-rays, glasses and speakers? These are common examples where engineers apply their knowledge of waves to design all types of useful products and tools that are evident in our daily lives. In the design of these products, engineers must be well aware of the characteristics of all waves and how waves can differ from each other. For example, the waves emitted by the microwave are very different from those that are emitted by the X-ray machine, which creates images of bones or teeth. Engineers need a full understanding of wave features in order to design safe and efficient products! But it's not all-engineers working to protect people and predict how tsunamis will travel after an earthquake in the ocean using wave properties. To successfully predict where the tsunami will travel, engineers need to understand how the waves move and the characteristics associated with the waves. Another example engineers use for wave features is when electrical engineers separate different types of waves so that the radio you use tracks on the right station, or your mobile phone only picks up the calls you want. If it wasn't for those engineers, you'd be getting calls from people you didn't know all the time. To achieve this, they need to have a clear understanding of wave characteristics and know how to separate different types of waves. Before designing and creating a solution to the challenge, engineers conduct research and collect information, as you did today. This step is an important part of the design process. amplitude: How far the medium (brushes and gutters or compressions and rare factions) moves from the resting position (where the medium is, if not moving). compression: when the longitudinal wave particles are close together. compressing (longitudinal) wave: a wave in which the average moves back and forth in the same direction as the wave. crest: the highest point of the cross wave. diffractions: bending waves around the object. Electromagnetic Wave: A wave that does not require medium travel, for example, it can travel through a vacuum. It's also called the EM wave. energy: performance. frequency: multiple waves pass from point to point in seconds. Measured in hertz (Hz). Mechanical Wave: A wave that requires medium travel. harvfaction : When particles in the longitudinal wave are far away. reflection: when the wave bounces from the surface. when the wave bends. transverse wave: a wave in which the average at right angles to the wave. trough: the lowest point of the transverse wave. wave: an alarm that carries energy from one place to another. wavelength: the distance between one point wave and the exact same spot on the next wave. Note Taking: Invite students to complete All About Waves during the lecture – the notes describe and refer to it as visual, which complement the lecture material. When the notes are turned to their desks, ask students different questions that the lecture included. Evaluate students' responses to assess their mastery. Worksheet: After the lecture, students have completed the Anatomy Wave Worksheet to see how well they applied what they learned. Trade-n-Test: In conclusion, each student will have their own wave characteristics (i.e. trough and crest height and wavelength) and write it down. Then there are the students to trade invented properties papers with other students and draw new waves based on given characteristics. Davidson, Michael W. Light Diffractions, Light and Color Physics, Optical Microscopy Primer. Last amended by 15 June 2006. Florida State University and the National High Magnetic Field Laboratory, optical microscopy, molecular expressions. Viewed February 7, 2012. Davidson, Michael W. Particle and Wave refraction, physics of light and color, optical microscopy primer. Last amended by 15 June 2006. Florida State University and the National High Magnetic Field Laboratory, optical microscopy, molecular expressions. Retrieved February 7, 2012 Lewis, Susan K. Tsunami Anatomy. Posted on Mar 29, 2005. Nova beta, PBS Online by WGBH. Retrieved February 7, 2012 Sound and Light: Chapter 1, 2. Quia, IXL Learning. Viewed February 7, 2012. NGSS Engineering aligned physics curriculum center for additional physics and physics science curriculum featuring Engineering. University of Colorado Viceroys © 2013; Originally © 2010 University of Clemson Ellen Zielinski; Courtney Faber; Marissa H. Forbes Research Experience for Teachers (RET) Program, Center for the Advancement of Engineering Fibers and Movies, Clemson University This lesson was developed through Clemson University's Engineering Fibers and Films Experience - the EFF-X Research Experience for Teachers program, funded by the National Science Foundation to give No. eec-0602040. However, these content may not represent the policies of the National Science Foundation, and you should not expect that from the federal government. Last modified: 7 November 2020 2020