

Electromagnetic Spectrum and Waves

SOL(s): PS 9 Student will investigate and understand the characteristics of transverse waves. Key concepts
d. the electromagnetic spectrum and e. technological applications of light

Instructional Objectives: Appropriate instructional objectives should be included here. The objectives should specify measurable student outcomes.
Students will be able to:
Describe electromagnetic spectrum
Distinguish between the different types of electromagnetic waves
Identify positions of different waves on the electromagnetic waves spectrum

Duration: 2 periods

Grade: 6-8

NOTE: The sections below expand as you type in electronic version.

Lesson Segment & Time Est.	Materials	Instructional Sequence	Teacher/Student Actions
<u>Introduction</u> <u>(Predict, Explain)</u>	Smartboard, 3 x 5 note cards	<p><i>“Hook” or advance organizer to get Ss involved - This should draw on students’ past experiences or previous understandings and should raise a question that can be answered through the activity. Provide students an overview of the lesson using the hook/adv organizer to make it meaningful.</i></p> <p>Predict: Elicit Students’ Ideas: Ask students to predict what they think will happen along with an explanation/their rationale for the prediction.</p> <p>Explain: Discuss students’ predictions: S. share predictions/explanations in a class discussion. Make sure to value all ideas. Discuss s. predictions and rationales and have s. discuss, given the range of predictions, which might be most reasonable.</p> <p>What are ways that electromagnetic waves (light) used in your everyday life? Students work in groups to come up with 3 ways light is used and how it works. Write ideas on one white board. Another white board will be used to predict where these ideas will be on the EM spectrum. Collect the board with prediction, display in front of class Ideas shared with class and grouped as they are called out. Teacher lists all ideas on board, students make 3 x 5 cards with these ideas (everyday use) on one side and name of wave on other side. Collect cards at the end of activity to be used later to practice order of waves.</p>	<p>T – group students and give each group 2 white boards – one for ideas and other for placement on scale S – brainstorm ideas and put on white board Later organize them based on similarities</p>

Lesson Segment & Time Est.	Materials	Instructional Sequence	Teacher/Student Actions
<u>Body</u> <u>(Observe)</u> <u>(Explain)</u>	computers, worksheet for student to gather information, and each other	<p><i>Includes sequential outline of lesson, with major questions, descriptions of activities, safety concerns, and directions. <u>Brief</u> descriptions of how major activities will be introduced and debriefed should be included. Be sure to include clear plans for student involvement (Q&A, hands-on activities, group work, etc). If technology is used, provide s. the opportunity to become familiar with it before the investigation.</i></p> <p>Brief filling in of notes to prepare students for research.</p> <p>Observe: S. Individually first, then come back to their group. Use chart with Electromagnetic Spectrum to fill in worksheet. Add their ideas (from display) and answer questions filling in information about the Electromagnetic Spectrum.</p> <p>Explain: (Small groups) S. discuss observations and their explanation for these observations in small groups then develop a written explanation in the form of filling in the worksheet.</p> <p>Students complete assessment working in group and discussing why they choose the answers they chose. Encourage students to use the worksheet as notes – leaving space for ideas and information that will be discovered throughout the day.</p> <p>Be sure to point out that the wavelength drawn is not to scale – with emphasis on not being able to draw a wavelength as small as a bacterium, or as large as a football field.</p> <p>Go over worksheet as a class and then watch a 5 minute video http://imagine.gsfc.nasa.gov/docs/science/know_12/emspectrum.html to see if there are more examples to place on their worksheet</p>	<p>t- move around the room assisting students with their decisions about where information about the EM spectrum goes on worksheet</p> <p>s – will be going through the worksheet, exploring the website and deciding what information is important to distinguish the different EM waves.</p>
<u>Closure</u> <u>(Explain, con't)</u> <u>Total Time =</u>	Back to the original electromagnetic spectrum in front of class	<p><i>This section sums up the lesson. Lesson objectives should be revisited/made explicit.</i></p> <p>Explain (continued): Whole-class discussion of small group observations/explanations. Provide the scientific explanation to students.</p> <p>Return to the original Electromagnetic Spectrum that the class placed information on and add any that were discovered during the observation period.</p>	<p>T – organizing any new information on EM spectrum at front of room</p> <p>S – offering information and defending decisions about where it will be place on spectrum</p>
<u>Assessment Plan:</u>	Teacher generated test	<p><i>Briefly describe how each objective will be assessed. (Don't rely solely on verbal feedback during the lesson). Provide at least 4 questions that you will use to assess students prior to and after the lesson to evaluate the lessons' effectiveness in developing student thinking.</i></p> <p><i>Test format will be both Multiple Choice and fill in the blank. They will be asked to place some of the more common devices on the appropriate spot on the Electromagnetic Spectrum and explain the difference between sample types of waves.</i></p>	<p>T – test – MC, label diagram, and fill in the blank</p> <p>S – scoring as high a grade as possible</p>
<u>Extension</u>	Websites	<i>Some students may grasp this concept quickly. They could check out how different satellites use the different parts of the em spectrum</i>	s- individual exploration and compilation of information to be shared in writing