International Centre for Radio Astronomy Research

The Electromagnetic Spectrum – Lesson Overview

Program Overview

This lesson will cover the electromagnetic spectrum (light spectrum).
Students will understand that light exists along the electromagnetic (EM) spectrum and includes types of light that the human eye cannot see.
Students will learn about the EM spectrum by working together to create a spectrum, listing through the different types of light that create the EM spectrum and completing a matching game that showcases the applications of the EM spectrum in astronomy.

After completing this lesson, students will understand the nature of the EM spectrum and its use in astronomy and use scientific vocabulary relating to the EM spectrum.

Science Understanding

- Earth and Space sciences
- Physicals Sciences

Required resources:

- Lesson slide deck
- Slinkies + whiteboard markers
- Electromagnetic Spectrum interactive poster and labels
- EM Spectrum object cards set (with labels and writable version)
- Accompanying teacher resources

Curriculum links:

<u>Physical Sciences Year 5</u>
Light energy travels from a source in a straight path and can be absorbed, reflected, refracted, form shadows and be sensed.
<u>Earth and Space Sciences Year 7</u>
Celestial objects can be classified as planets, stars, moons, asteroids, meteors, comets, constellations and galaxies; planets in our solar system have distinguishing features, including composition, temperature, size, orbit, rotation, tilt of axis, moons and rings.
<u>Physical Sciences Year 9</u>
Light is an electromagnetic wave; light is made up of photons that have both particle and wave properties; light can be reflected from plane and curved mirrors and refracted wen passing through concave and convex lenses.
<u>Earth and Space Sciences Year 10</u>
The formation of stars, galaxies and solar systems has continued since the time of the Big Bang; stars have a life cycle determined by their mass.
Space exploration contributes to knowledge of the formation and evolution of the Universe and Earth, as well as providing useful tools and technologies to improve our life on Earth.

Science Inquiry Skills

- Questioning & predicting (Y7/8)
- Evaluating (Y7/8)
- Communicating (Y9/10)
- Collaborating & applying (Y9/10)

General Capabilities

- Literacy
- Numeracy
- Critical and creative thinking
- Personal and social capability

Lesson Layout (45-60 minutes)	

1. Introduce the concept of light.
   Establish and discuss what is light - how does it travel to us, how do we use light and what information can we gain from light.

2. Introduce the word spectrum and its meaning.
   Activity – Ask the students to create a height spectrum of themselves from shortest to tallest.

3. Investigate different features of a light wave.
   Discuss what is a wavelength and how we would measure it (crest to crest).
   Activity – Experiment with slinkies to create wavelengths of different sizes. Get students to note the size of the wavelength and how much energy they need to input to create the wave.

4. Create the Electromagnetic Spectrum.
   Establish that there are different types of light based on the size of their wavelength (and energy/frequency they have) and that it can be sorted into a spectrum
   Activity – Create the Electromagnetic Spectrum by using the labels and the interactive poster to introduce each part of the spectrum – with each new type of light discuss how the wavelength/frequency changes; reflect real world examples.

5. Applications of the Electromagnetic spectrum – Multiwavelength Astronomy.
   Discuss the concept of multiwavelength astronomy and observing objects in different kinds of light. Demonstrate this by using the Crab Nebula cards and seeing what it looks like in visible, infrared, radio and x-ray light. (Alternate example is Jupiter).
   Activity – Provide the other card sets to the students and ask them to work together in groups to identify and label which image represents each visible, infrared, radio and x-ray. Once completed, go through the answers together as a class.

6. The science behind multiwavelength astronomy.
   Using the card sets, discuss what science we are learning from each different type of wavelength and how scientists combine this knowledge together to further understand the physics of our Universe.