National Standards

Benchmarks for Science Literacy

4A/E6 (Grades: 3-5): A large light source at a great distance looks like a small light source that is much closer.

4D/M9 (Grades: 6-8): Materials vary in how they respond to electric currents, magnetic forces, and visible light or other electromagnetic waves.

4E/E2b (Grades: 3-5): When warmer things are put with cooler ones, heat is transferred from the warmer ones to the cooler ones.

4E/E2c (Grades: 3-5): A warmer object can warm a cooler one by contact or at a distance.

4E/M3 (Grades: 6-8): Thermal energy is transferred through a material by the collisions of atoms within the material. Over time, the thermal energy tends to spread out through a material and from one material to another if they are in contact. Thermal energy can also be transferred by means of currents in air, water, or other fluids. In addition, some thermal energy in all materials is transformed into light energy and radiated into the environment by electromagnetic waves; that light energy can be transformed back into thermal energy when the electromagnetic waves strike another material. As a result, a material tends to cool down unless some other form of energy is converted to thermal energy in the material.

4E/M6 (Grades: 6-8): Light and other electromagnetic waves can warm objects. How much an object's temperature increases depends on how intense the light striking its surface is, how long the light shines on the object, and how much of the light is absorbed.

4F/E3 (Grades: 3-5): Light travels and tends to maintain its direction of motion until it interacts with an object or material. Light can be absorbed, redirected, bounced back, or allowed to pass through.

4F/M1 (Grades: 6-8): Light from the sun is made up of a mixture of many different colors of light, even though to the eye the light looks almost white. Other things that give off or reflect light have a different mix of colors.

4F/M2 (Grades: 6-8): Something can be "seen" when light waves emitted or reflected by it enter the eye—just as something can be "heard" when sound waves from it enter the ear.

4F/M5 (Grades: 6-8): Human eyes respond to only a narrow range of wavelengths of electromagnetic waves-visible light. Differences of wavelength within that range are perceived as differences of color.

4F/M6 (Grades: 6-8): Light acts like a wave in many ways. And waves can explain how light behaves.

4F/M8 (Grades: 6-8): There are a great variety of electromagnetic waves: radio waves, microwaves, infrared waves, visible light, ultraviolet rays, X-rays, and gamma rays. These wavelengths vary from radio waves, the longest, to gamma rays, the shortest.

5E/M3c (Grades: 6-8): Almost all food energy comes originally from sunlight.

8C/M10 (Grades: 6-8): Some resources are not renewable or renew very slowly. Fuels already accumulated in the earth, for instance, will become more difficult to obtain as the most readily available resources run out. How long the resources will last, however, is difficult to predict. The ultimate limit may be the prohibitive cost of obtaining them.

NSTA National Science Education Standards

B.3.1 (Grades: K-4): Light travels in a straight line until it strikes an object. Light can be reflected by a mirror, refracted by a lens, or absorbed by the object.

B.3.2 (Grades: K-4): Heat can be produced in many ways, such as burning, rubbing, or mixing one substance with another. Heat can move from one object to another by conduction.

B.3.3 (Grades: 5-8): Light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection). To see an object, light from that object--emitted by or scattered from it--must enter the eye.

B.3.6 (Grades: 5-8): The sun is a major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches the earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation.

C.4.3 (Grades: 5-8): For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs.

D.2.2 (Grades: K-4): The sun provides the light and heat necessary to maintain the temperature of the earth.

D.3.4 (Grades: 5-8): The sun is the major source of energy for phenomena on the earth's surface, such as growth of plants, winds, ocean currents, and the water cycle. Seasons result from variations in the amount of the sun's energy hitting the surface, due to the tilt of the earth's rotation on its axis and the length of the day.