



## Long Range Grade 4 Science and Technology Plan

### Term 2: Energy and Control – Light and Sound Energy

#### Specific Expectations

##### *Understanding Basic Concepts*

- identify a variety of natural and artificial light sources (e.g., the sun, a candle, a light bulb);
- describe the behaviour of light, using their observations, and identify some of its basic characteristics (e.g., that it travels in a straight path, bends as it passes from one medium to another, and is reflected off shiny surfaces);
- distinguish between objects that produce their own light and those that reflect light from another source (e.g., candles and the sun emit their own light; the moon reflects light from the sun);
- identify, through observation, colour as a property of light (e.g., use prisms to show that white light can be separated into colours);
- predict the location, shape, and size of a shadow when a light source is placed in a given location relative to an object;
- investigate and compare how light interacts with a variety of optical devices (e.g., kaleidoscopes, periscopes, telescopes, magnifying glasses);
- recognize, using their observations, that most objects give off both light and heat (e.g., the sun, a candle, a light bulb), and identify some objects that give off light but produce little or no heat (e.g., light sticks, fireflies);
- recognize, using their observations, that sound can travel through a substance (e.g., place a vibrating tuning fork in a shallow dish of water and describe what happens to the water; place rice on a drum-head and describe what happens to the rice when the drum is tapped);
- group a variety of sounds according to pitch and loudness and demonstrate how the sounds can be modified;
- compare the range of sounds that humans can hear with the range of sounds that other animals can hear (e.g., dogs and cats can hear higher frequencies than humans);
- recognize that sounds are caused by vibrations;
- describe how the human ear is designed to detect vibrations.

##### *Developing Skills of Inquiry, Design and Communication*

- formulate questions about and identify needs and problems related to their own experiences with light and sound, and explore possible answers and

solutions (e.g., identify different sounds and their sources in their environment);

- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions;
- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g., use terms such as source, artificial, beam of light, reflection in describing the behaviour of light; or pitch, loudness, vibrations in describing sounds);
- compile data gathered through investigation in order to record and present results, using tally charts, tables, and labelled graphs produced by hand or with a computer (e.g., create a “sound diary” to record the sounds encountered over a period of time);
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, drawings, and charts (e.g., draw diagrams showing the position of the light source and location of the shadow; create a chart showing how devices that rely on or provide light and sound contribute to the user’s convenience and comfort);
- design, make, and test an optical device (e.g., a periscope, a kaleidoscope);
- design and make musical instruments, and explain the relationship between the sounds they make and their shapes;
- follow safe work procedures in all investigations (e.g., direct mirrors away from the sun to ensure that the sun’s rays are not reflected into their eyes or the eyes of others; avoid producing excessively loud sounds).

#### *Relating Science and Technology to the World Outside the School*

- identify various uses of sounds encountered daily (e.g., warning sounds such as security alarms, fire sirens, smoke detector alarms );
- describe the harmful effects of high noise levels and identify potential noise hazards at home or in the community (e.g., some leaf -blowing machines);
- describe, using their observations, how sounds are produced in a variety of musical instruments (e.g., wind instruments) and identify those they like listening to best;
- identify sound-related jobs (e.g., tuning pianos) and the role of sound in different jobs (e.g., the beep that warns us a van is backing up; the noise of jackhammers as an occupational hazard);
- describe devices that extend our ability to see and hear (e.g., a telescope, a magnifying glass, an optical microscope, a hearing aid, a microphone or megaphone);
- identify different uses of light at home, at school, or in the community, and explain how their brightness and colour are related to their purpose (e.g., vivid neon lights are used for advertising; blue lights are used to identify

- snow-removal vehicles; dim lighting is used to create a soothing atmosphere in restaurants);
- describe the effect on the quality of life if light and sound could not be used as forms of energy;
  - identify common phenomena related to light and sound (e.g., rainbows, shadows, echoes) and describe the conditions that create them;
  - identify systems that use light or sound sensors to detect movement (e.g., motion detectors, check-out scanners, the eye, the ear).