**GRADE 1 SUMMARY**

**Grade 1 Learning Standards (From BCEd Curriculum)**

* natural and artificial sources of light
* natural sources include the sun; artificial sources include light bulbs
* and sound
  + - natural sources include crickets; artificial sources include car horns
* properties of light
  + - examples: brightness, colour
    - objects are made visible by radiating their own light or being illuminated by reflected light
    - interactions of light with different objects create images and shadows
* light interactions can make plants grow, make shadows, or cause sunburn, depending on the source and location (seasons depend on light from the sun and how spread out the sun’s rays are)
* plants grow toward light
* and sound
* examples: pitch, tone, volume
* ways of making, recording, and transmitting sound, etc.
* depend on their source and the objects with which they interact

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|  |  | **WHAT DO Grade 1’s need to know about Light and Sound?**  Both light and sound are forms of energy. Light is an electromagnetic wave that can be seen by humans (it represents only a small portion of the electromagnetic spectrum). The wave nature of light was first illustrated through experiments on diffraction (splitting light) and interference (light waves cancelling each other out). Like all electromagnetic waves, light can travel through a vacuum—it doesn’t require any particles to carry it. Sources of light can be natural (the sun, lightning, chemical reactions like fire) or artificial (lamps, computer screens). Intensity is the absolute measure of the light’s magnitude; brightness is the measure of light to the human eye (Gr 1’s can learn about brightness).  Light travels in straight lines. When it hits an object, it can either be reflected, absorbed, or transmitted. Some objects (ex. Mirrors) reflect a large percentage of the light. Other objects (ex. White paper) reflect much of the light, but due to imperfections in the surface, the reflected light does not form an image. Dark objects absorb light.  Sunlight is made up of a range of different wavelengths of light (ok, maybe Gr 1’s don’t need to know wavelengths), meaning a variety of colours. Light passing through a prism will be refracted (bent) and the different colours will be shown. There are seven simple, named colors in English (and many other languages) each associated with a band of monochromatic light. In order of increasing wavelength they are red, orange, yellow, green, blue, indigo and violet (ROYGBIV—the colours of the rainbow).  Light moves at a rate that seems almost instant to humans, approximately 300,000,000 m/s.  Sound is produced by vibrations and is a type of mechanical energy that relies on the movement of particles. Sound does not occur in a vacuum (place where there are no particles—like space). Sound needs a medium (solid, liquid, or gas) in which to travel.  Sound travels at a speed much slower than light. The speed of sound depends on two things: the medium through which the waves travel and the temperature of the medium. Sound travels at 343 m/s in dry air; sound travels much faster in liquids because the particles are closer together—sound will travel about 1500 m/s in water, and even faster in many solids. If you are trapped after an earthquake, it will be much more useful to tap on a metal pipe than to yell into the air!  Sound is a variation in pressure. A region of increased pressure on a sound wave is called a compression (or condensation). A region of decreased pressure on a sound wave is called a rarefaction (or dilation).  Sources of sound can be natural (voices, thunder, things falling, waves…) or artificial (musical instruments, drums, radio, iPhone). Pitch relates to the frequency of the waves—higher pitch means higher frequency. Tone refers to the how regular the vibration is. Musical tones have very regular vibrations. Noises have irregular vibrations. |

**CURRICULAR COMPETENCIES**

* Questioning and predicting—can students generate their own questions?
* Planning and conducting—can they design and plan an experiment?
* Processing and analyzing data and information—can they record data and see patterns?
* Evaluating—can they draw conclusions from their data?
* Applying and innovating—can they improve their design?
* Communicating—can they talk, write and draw about their learning?

**WHY IS IT IMPORTANT?**

Light and sound are key information gathering paths for humans—as our information about the world is largely picked up by visual observation and by verbal communication.

Light allows us to create art, read, observe the natural world, observe the arts. Sound allows us to communicate, to create and share music, and to observe the natural world.

**KEY VOCABULARY**

**Reflect:** to throw back light or heat without absorbing it

**Refract:** makes light bend when it passes through it (ex: water, glass, clear plastic)

**Absorb:** to take in or soak up

**Brightness:** the amount of light givenout

**Wave:** movement of energy through a substance like air or water

**Frequency:** how quickly the waves move

**Pitch:** the way the sound changes as frequency of the waves change

**Loudness:** the amount of sound made as the size of the wave changes

**SOME INQUIRY QUESTIONS**

* Do animals see the same things as we do?
* How do shadows change during the day?
* How can we make a shadow puppet grow or shrink?
* How does light change over the day? Over the year?
* Is it easier or harder to hear under water?
* Why some sounds musical and some sounds harsh?
* What is the range of sounds humans can make (pitch, volume)?
* What is the loudest noise ever?

**SUGGESTED PROVOCATIONS/ACTIVITIES/EXPERIMENTS**

**Thunder and lightning** are a good entrance into both sound and light. Make your own lightning in your classroom: Supplies are a balloon and a metal spoon. Have students rub the inflated balloon vigorously on their heads for at least two minutes or take turns rubbing it on each other. Then go into a dark room and touch the spoon to the balloon and see what happens! (This will work much better on a dry day).

Does light travel in **straight lines**? <https://www.wikihow.com/Prove-That-Light-Travels-in-a-Straight-Path>

Use a **raybox** to demonstrate the effect of various lenses and mirrors on light. Rayboxes with lens and mirror kits may be borrowed from your catchment high school.

On a sunny day, go outside and use lenses, mirrors and old CD’s to **play with the reflection, refraction of light:** https://buggyandbuddy.com/rainbow-science-create-light-patterns-with-a-cd/.

Some **easy light and shadow experiments**: <https://www.kcedventures.com/blog/easy-science-experiments-shadow-activities>

Use an old **OHP** and some coloured transparencies as a cheap light box. You can experiment with shadows and colour combinations indoors. Make a light Exploratorium area—use dark landscape fabric to make a dark corner, and use white banner paper for a screen. Here’s another activity for your light center: <https://buggyandbuddy.com/reflection-science-with-light-patterns-in-a-box/>

**Slinkies** can be used as a great way to demonstrate waves, and the idea of the compression and rarefaction. They make visible what is happening in the invisible air when sounds are made. https://www.youtube.com/watch?v=\_D0CSUa0sbM

Use **boomwhackers** to investigate **tone and pitch**: <https://www.scienceworld.ca/resources/activities/boomwhacker-orchestra>

**Make a gong** using yarn, two different sized spoons, and a ruler: https://www.kcedventures.com/blog/the-science-of-sound-waves-an-awesome-experiment-for-kids

**CROSS-CURRICULAR CONNECTIONS**

Music and ADST—make your own instruments. Here someone has compiled a list of great ideas for making musical instruments : <http://www.amarketplaceofideas.com/wp-content/uploads/2014/08/All-Homemade-Instrument-Directions.pdf> (These start with simple home-made boomwhackers and move through drums and very complex xylophones and marimbas!)

Art: discuss the mixing of RGB light in computers (great site to try: <http://web.stanford.edu/class/cs101/image-rgb-explorer.html> or iPad app RGB explorer (free).

Art can also discuss the differences with mixing pigment (compared to light above).

Drama—make a shadow puppet show…how might you make coloured shadows? How can puppets grow or shrink? Here are some very detailed instructions: <http://www.mykidsadventures.com/shadow-puppet-show/>

**On a Beam of Light** by Jennifer Berne is the perfect anchor book for questioning and considering curiosity…. a necessary trait for scientists.

When reading out loud, discuss how pitch, tone and volume contribute to the mood of a spoken piece.

**INDIGENOUS PERSPECTIVES**

Sound was used by Indigenous people to communicate and to hunt. Walk outside and use natural materials like blades of grass to make bird calls or fawn sounds. Grass: <https://www.youtube.com/watch?v=qc9Zc2g9D94> Bird calls with straws: <https://www.youtube.com/watch?v=uGFCLlv8xXQ>

Music is an important part of Indigenous cultures—drums, rattles, pipes and many other instruments are used to make music. This is an excellent website to explore First Nations music and instruments: <http://native-drums.ca/en/home/>

Episode 1 of Coyote Science is all about light: <http://aptn.ca/coyotescience/episode-guide/>

Stories about the sun are important in Indigenous culture:

* The Sun and the Moon by Celestine Aleck
* How Raven Stole the Sun (Raven Tales series)

**RESOURCES**

Study Jams on light: <http://studyjams.scholastic.com/studyjams/jams/science/energy-light-sound/light.htm>

The Light and Sound with Toys and Everyday Stuff by Natalie Rompella is an excellent starting point for studying these lights and sound concepts.

**References:**

The Physics Hypertextbook: <https://physics.info>

SD71 Science Info (this is a great source of info for all science areas):

https://portal.sd71.bc.ca/group/wyhzgr4/physics/grade1/Documents/sd71\_web\_Physics\_g1.pdf