
Grade 4 Learning Experiences: Sound and Light with a Purpose

Experience 4: Career Spotlight: Connect with an expert

[Long Range Plan: Grade 4 Model 1](#)

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| <p>Overview of learning experiences – why these activities</p> | <p>Overview of Learning Experiences</p> <p>In this series of activities, students will first become aware of issues related to light and noise pollution produced by humans (Experience 1). They will then be called to design solutions such as better lampposts, or sound-dampening surfaces for example (Experience 2). There are also optional experiments that would help students in their design if the topics of sound and light, reflection, and absorption have not yet been addressed (Experience 3). For the <i>Career Spotlight</i>, the class connects with an expert in the field to either get ideas for the design, get feedback on their design or make career path connections (Experience 4).</p> <p>Guiding Questions</p> <p>What is sound and light pollution and how does it affect living things? How do machines that make sounds and lights affect living things?</p> |
| <p>Prior Knowledge / Prior Skill Set(s)</p> | <p>Background Knowledge and Concepts (Teacher)</p> <ul style="list-style-type: none"> ● Maintain safe facilities & laboratory equipment ● Identify potential workplace hazards & mitigation measures ● Aware of Transferable Skills ● Aware of Culturally Relevant & Responsive Pedagogy ● Aware of universal design and differentiation Learning for All UDL (p.13), DI (p.17) ● Aware of strategies to help new language learners Supporting English Language Learners A practical guide for Ontario educators Grades 1 to 8 ● Understand how to engage in Scientific and Engineering Design Processes ● Understand basic block-based coding concepts, platforms, functions, and algorithms for software such as Scratch and Micro:bit Make Code. <p>The following resources can be used by teachers to review the material or for students to do research.</p> |

Research and concept resources

Light pollution

[Light pollution primer from Let's Talk Science](#)

[Light pollution - Earth Day](#)

[Dark Sky - Light Pollution Effects on Wildlife and Ecosystems](#)

Noise pollution

[Noise pollution - National Geographic](#)

[Noise in our environment](#) Ontario Government

[For Whales Noise is Pollution too](#)

Background Knowledge and Skills (Students)

The sound and light concepts may have been seen with students in a previous unit (potential experiments can also be done before or during the engineering design process; see Experience 3).

- Light travels in a straight line.
- Light is reflected and absorbed differently by various surfaces.
- Sound travels in a straight line.
- Sound is reflected and absorbed differently by various surfaces.

Animal habitat concepts








- Light and sounds are part of animal habitats
- Some animals are active during the day, night, or dawn/dusk (diurnal animals, nocturnal animals, crepuscular animals)
- Some animals use sounds to communicate, and/or to locate themselves (echolocation) in their habitat

Students often have misconceptions about Sound and Light. Some can be found on the [Amasci Children's Misconceptions about Science](#) website.

For example:





- A white light source, such as an incandescent or fluorescent bulb, produces light made up of only one color.
- Light is associated only with either a source or its effects. Light is not considered to exist independently in space; hence, light is not conceived of as "traveling".
- Light reflects from a shiny surface in an arbitrary manner

Additionally, students may not understand that light and sound travel from a source.

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| <p>Strand A - STEM Investigation and Communication Skills</p> | <p>The following expectations from the A strand will be covered in the activities.</p> <p>  A1.5 communicate their findings, using science and technology vocabulary and formats that are appropriate for specific audiences and purposes</p> <p> A.2 identify and describe impacts of coding and of emerging technologies on everyday life, including skilled trades</p> <p> A3.1 describe practical applications of science and technology concepts in various occupations, including skilled trades, and how these applications address real-world problems</p> <p> A3.2 investigate how science and technology can be used with other subject areas to address real-world problems</p> <p>Specifically, the Strand A expectations are combined and connected to the following four activities:</p> <p>  A.2, A.3</p> <p>Experience 4: Career Spotlight: Connect with an Expert Students interview an expert in the field to get ideas for their design, get feedback on their design or make career path connections.</p> |
| <p>Overview / Big Ideas/ Fundamental Concepts</p> | <p>Big Ideas Light and sound affects the habitats and life of animals. The engineering process can help us find solutions to problems.</p> <p>Fundamental Concepts https://www.dcp.edu.gov.on.ca/en/curriculum/science-technology/context/fundamental-concepts</p> <p>Structure and Function: This concept focuses on the interrelationship between the function or use of a natural or human-made object and the form that the object takes.</p> |

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| | <p>Sustainability and Stewardship: Sustainability is the concept of meeting the needs of the present without compromising the ability of future generations to meet their needs.</p> <p>Stewardship involves understanding that we need to use and care for the natural environment in a responsible way and making the effort to pass on to future generations no less than what we have access to ourselves. Values that are central to responsible stewardship are as follows: using non-renewable resources with care; reusing and recycling what we can; and switching to renewable resources where possible.</p> |
| Learning Goals / Success Criteria | <p>The following success criteria are examples of what can be co-created with the class.</p> <p>Experience 4 Career Spotlight: Connecting with an expert</p> <p>Learning Goal: Students (mediated by the teacher) will connect with an expert (class email, video conference, field trip, guest speaker, phone interview with the class)</p> <p>Success Criteria:</p> <ul style="list-style-type: none"> ● I can compose a question for a science/engineering/trades expert ● I have learned how I could become a science/engineering/trades expert <p>Ministry of Education Key Points</p> <p>The key points listed below will be addressed within these experiences.</p> <ul style="list-style-type: none"> ● STEM Skills and Connections: Perspectives and approaches that provide opportunities for students to investigate and apply concepts and skills from all areas of learning. ● Research and Experimentation Processes: Provides students with the scientific literacy skills needed to approach scientific questions that are becoming a part of everyday life. ● Hands-on, Experiential Learning: Includes hands-on, experiential learning opportunities to support classroom activities that encourage curiosity ● Coding: Allows students to explore a wide variety of science and technology concepts and contexts through coding, while also learning valuable skills related to the automation and control of systems. ● Emerging Technology: Ensures that students are aware of exciting and innovative solutions in science and technology that are being implemented today and that may be introduced in the future. |

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| | <ul style="list-style-type: none"> ● Skilled Trades: Students consider the practical application of skills and concepts within the skilled trades and related occupations. ● Contributions to Science and Technology: Showcases the important contributions made to science and technology by people with diverse lived experiences. Students also explore real-world issues by connecting scientific and technological knowledge systems and perspectives from various cultures, including connecting Indigenous sciences and technologies and Western science and technology. |
| <p>Learning Experience(s)</p> <p>Minds-on</p> | <p>Minds-on</p> <p>This minds-on activity can be done at the beginning of Experience 1 or any other activities (2, 3, or 4) if Experience 1 is not done.</p> <p>Discussion as a class:</p> <ul style="list-style-type: none"> ● Can you think of times when light/sound bothered you? (bright light, loud music) ● What did you do? (put on sunglasses, close the blinds to sleep in the dark, turn down the music, and close a window) ● What do you notice or wonder about these images (Grade 4 - Sound & Light - Images to prompt discussion) <p>Draw from student experience about different living environments, how we light our dwellings inside and out, and what produces sounds in our surroundings. Use images to support multiple language learners.</p> <p>Note: Your students have a wealth of experience to draw on. Some students may have (or know someone with) sensory sensitivities and can pull from that experience to explain to others what they can do. Some may be familiar with city centers and construction sites. Some students may be familiar with the lights from greenhouses in agricultural settings.</p> <p>Note: The focus of the research in Experience 1 and design in Experience 2 is on problems with sounds and light from urban centers, but some students may not be familiar with extreme sounds/lights from city centers and may need additional images and videos to situate the following research. Using visuals is essential for some and beneficial to all.</p> <p>Building vocabulary: this is a great opportunity to build vocabulary. As discussions unfold words can be written on an anchor chart or in a virtual word wall like slides with additional images. For example, light, sound, noise, brightness, night, day, loudness dampening, headset, sunglasses, blinds/curtains.</p> |

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| <p>Action</p>  <p>A3</p> | <p>Experience 4: Career Spotlight</p> <p>Students interview an expert in the field to get ideas for their design (Experience 2A), get feedback on their design (Experience 2B), or make career path connections.</p> <p>This can be done through the teacher through a class email, video conference, field trip, phone interview with the class, or inviting a guest speaker.</p> <p>Examples of expert fields:</p> <ul style="list-style-type: none"> ● Industrial Noise Control ● Industrial Design ● Nature conservation agents ● Construction workers that use safety equipment like hearing protection or a welding mask. ● Health and safety advisor ● or additional trades on CareersInTrades.ca <p>Students can write questions ahead of time. Consider using STEM sentences and making vocabulary words visible and accessible to students. The teacher can supplement questions to get information about the career path of the expert and how students could follow a similar pathway.</p> <p>Alternatively, research can also be done with career profiles such as Let’s Talk Science: Ashley Noseworthy, CEO/Founder of Edgewise Environmental</p> <p>“ My primary interest is to determine the acoustic effect (i.e., the noise) and how this noise might affect the wildlife that inhabits that environment.”</p> |
| <p>Consolidation</p>    <p>A1.5</p> | <p>Consolidation</p> <p>The consolidation can be the culmination of a combination of the 4 activities</p> <p>Students may choose from a variety of ways to present their research (Experience 1), experiments (Experience 3), and/or design and reflection on potential improvements (Experience 2). Potential formats include oral presentations, posters, slide decks recorded through screen capture, podcast interviews of students by students, design fairs with invited guests, and gallery walks). The intended public can include the experts of the Career Spotlight (see Experience 4), other classes, and members of the community.</p> |

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| | <p>Students are invited to reflect on how they can make connections with the concepts of sound and light and animal habitat and the designs presented. The teacher can remark when students are using appropriate vocabulary.</p> |
| <p>Science and Technology Expectations</p> | <p>C. Matter and Energy: Light and Sound</p> <p>C1.1 assess the impacts on society of devices that use the properties of light or sound, or both</p> <p>C1.2 assess the impacts on the environment of light energy and sound energy produced by various technologies, while taking different perspectives into account</p> <p>C2.6 describe how different objects and materials interact with light and sound energy</p> <p>B. Life Systems: Habitats and Communities</p> <p>B1.1 assess positive and negative impacts of human activities on habitats and communities, while taking different perspectives into account</p> <p>B1.2 analyse the impact of the depletion or extinction of a species on its habitat and community, and describe possible actions to prevent such depletions or extinctions</p> <p>B2.1 describe habitats as areas that provide organisms, including plants and animals, with the necessities of life, and identify ways in which a local habitat provides these necessities</p> |
| <p>Science and Technology Vocabulary</p> | <p>Light - Radiative energy that can be detected by the human eye and makes things visible. When light strikes a surface, it is absorbed, reflected, or transmitted.</p> <p>Sound - A kind of energy that is produced by vibrating matter and transmitted by waves through air and other media; the sensation produced when these waves stimulate the organs of hearing. The eardrums convert this vibrational energy into signals that travel along nerves to the brain, which interprets them as voices, music, or noise.</p> <p>Energy - The capacity to do work.</p> <p>Reflection - Changing the direction of a light ray by bouncing it off a surface. All</p> |

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| | <p>objects reflect light to some extent (some, such as a mirror, better than others). Sound can also be reflected; a common example of this is an echo.</p> <p>Absorption - When the light or sound is absorbed by a surface and not reflected.</p> <p>Skyglow - the brightness of the night sky in a built-up area as a result of light pollution.</p> <p>Glare - strong and dazzling light.</p> <p>Light trespass - Light trespass occurs when spill light is cast where it is not wanted.</p> <p>Loudness - is the attribute of a sound that determines the magnitude of the auditory sensation produced</p> <p>Dampening - makes less strong or intense</p> <p>Opaque - Not allowing light to pass through.</p> <p>Translucent - allowing light, but not detailed shapes, to pass through; semitransparent.</p> <p>Transparent - allowing light to pass through so that objects behind can be distinctly seen.</p> <p>Daytime - during the day</p> <p>Nighttime - during the night</p> <p>Diurnal animal - active during the day</p> <p>Nocturnal animals - active during the night</p> <p>Crepuscular animals - active early in the morning (dawn) and in the evening (dusk).</p> <p>Natural light - light coming from the sun or fire</p> <p>Artificial light - light coming from a human-made source</p> <p>Migration - The movement of animals from one region to another. In most cases, organisms migrate to avoid local shortages of food, usually caused by winter or overpopulation. Animals may also migrate to a certain location to breed, as is the case with some fish.</p> |
| Equipment and Materials | |
| Timeline and Preparation | These are approximate times that can be shortened or extended based on student engagement, interest, and additional inquiry. |

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| | <p>Minds-on 20 minutes</p> <p>Experience 4 Career Spotlight 60 minutes</p> <p>Consolidation 80 minutes</p> |
| Safety Considerations | <p>Refer to these STAO and OCTE Safety resources:</p> <ul style="list-style-type: none"> · Safety in Elementary Science and Technology (STAO) · Safe Activity Foundations in Education Document (SAFEdoc) Science and Technology, Grades 1-8 (OCTE) · Ontario Curriculum Program Planning – Health and Safety |
| Opportunities For Assessment | <p>Potential examples:</p> <p>Assessment FOR Learning</p> <ul style="list-style-type: none"> • Classroom discussions with initial prompts <p>Assessment AS Learning</p> <ul style="list-style-type: none"> • Small group discussions, giving each other peer feedback on questions for the expert <p>Assessment OF Learning</p> <ul style="list-style-type: none"> • Summary (written or verbal) of the career connections <p>Throughout the activity we are looking at the following criteria for success:</p> <ul style="list-style-type: none"> • I can compose a question for a science/engineering/trades expert • I have learned how I could become a science/engineering/trades expert <p>Information to observe these criteria can be collected through verbal conversations with the students, student presentation (synchronous/asynchronous), observation of the students, in journals, notes and sometimes in a final product.</p> |
| Instructional Strategies and Adaptability | <p>Strategies from the following documents have been embedded throughout the activities.</p> <ul style="list-style-type: none"> • Culturally Relevant & Responsive Pedagogy • Aware of universal design and differentiation Learning for All |

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| | <p>UDL (p.13), DI (p.17)</p> <ul style="list-style-type: none"> • Strategies to help new language learners Supporting English Language Learners A practical guide for Ontario educators Grades 1 to 8 <p>For example:</p> <ul style="list-style-type: none"> • Giving student voice and choice • Pulling from students' lived experience • Building vocabulary collaboratively • Offering visuals to support language learning • Using assistive technology to access texts • Offering multiple ways of showing understanding • Doing assessment and evaluation by using conversations and observations to accompany the process and products |
| Additional Supporting Resources | <p>Light pollution Light pollution primer from Let's Talk Science Light pollution - Earth Day Dark Sky - Light Pollution Effects on Wildlife and Ecosystems</p> <p>Noise pollution Noise pollution - National Geographic Noise in our environment Ontario Government For Whales Noise is Pollution too</p> <p>Misconceptions in science http://amasci.com/miscon/opphys.html</p> <p>Careers CareersInTrades.ca Career Profiles - Let's Talk Science Ashley Noseworthy, CEO/Founder of Edgewise Environmental</p> <p>Safety Safety in Elementary Science and Technology (STAO) Safe Activity Foundations in Education Document (SAFEdoc) Science and Technology, Grades 1-8 (OCTE) Ontario Curriculum Program Planning – Health and Safety</p> |
| Cross-Curricular Opportunities | <p>Language: Oral and written communication (questions to the expert, hypothesis/observation/conclusion, presentation of the design).</p> |

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| | <p>Math: Measurements while doing designs, builds, and experiments</p> <p>Social Studies: Use the social studies inquiry process to investigate some issues and challenges associated with balancing human needs/wants and activities with environmental stewardship in one or more of the political and/or physical regions of Canada (B2)</p> |
| <p>Future Opportunities / Next Steps</p> | <p>Next Steps:</p> <ul style="list-style-type: none"> ● Revisit the design in activity 2 ● Overall next step: Students start a Lights Off Campaign at their school to help with energy conservation and do an energy audit in their school. Check out Canada Ecoschools for resources. |