# Light and Life Lesson 1

## Critical Learning
- A wide range of technologies utilize the properties of light and colour.
- Structure and function focus on the interrelationships between the function or use of a natural or human-made object and the form that the object takes.

## Guiding Questions
- What technologies use the properties of light and colour?
- What do technologies that use the properties of light and colour have in common?
- How do these technologies affect our lives?

## Curriculum Expectations

### Scientific Investigation Skills and Career Exploration
**A1.** demonstrate scientific investigation skills related to both inquiry and research in the four areas of skills; initiating and planning, performing and recording, analysing and interpreting, and communicating
- **A1.10** draw conclusions based on inquiry results and research findings, and justify their conclusions
- **A1.11** communicate ideas, plans, procedures, results, and conclusions orally, in writing, and/or in electronic presentations, using appropriate language and a variety of formats

### Physics: Light and Applications of Optics
**E1.** analyse how properties of light and colour are applied in technology and how these technologies have an impact on society
- **E1.2** describe the role of selected optical technologies in the transmission of information, and analyse their impact on society [AI, C]

## Learning Goals
Students will be able to:
- identify technologies that use the properties of light and colour
- explain how these technologies affect their lives
- select and use a graphic organizer to communicate information about a technology, and explain the rationale for selecting the graphic organizer
- justify what life would be like with or without a technology

## Instructional Components and Context
### Readiness
- Group work norms and skills, e.g., taking roles, taking turns, disagreeing agreeably, coming to consensus
- Using graphic organizers, e.g., T-chart, mind map, table for organizing and communicating ideas

### Terminology
- **Light**
- **Colour**
- **Impact**
- **Reflection**
- **Refraction**

### Materials
- Chart paper
- Markers
- Sticky notes
- Sample graphic organizers
- Sample rubric
Light and Life  Lesson 1

Minds On (Elicit, Engage)

Small Groups/Whole Class ➔ Connecting Prior Knowledge and Generating Ideas
Display a few devices that use light, e.g., LCD projector, digital camera. Explain that the devices use light in order to function.

In small groups, students brainstorm technologies that use light, recording one technology per sticky note.

In a Round Robin, groups share items from their lists. As groups call out the technologies, collect sticky notes and cluster on an anchor chart without revealing the categories, i.e., technologies that use light (reflection or refraction), use colour theory, use both, or use neither.

Once all the items are shared, pose the following questions: Why are the stickies clustered in this way? What do the technologies in each of the clusters have in common?

Whole Class ➔ Learning Goals
Share the learning goals and guiding questions for this lesson. Review any safety procedures pertinent to this lesson.

Action! (Explore, Explain)

Small Groups ➔ Organizing Information in a Graphic Organizer
Assign each group a technology from the list. Students communicate information about the technology on a graphic organizer of their choice, e.g., T-chart, mind map, table, using a set of question prompts. Circulate and monitor students' discussion, paying particular attention to their talk on how they will organize their information in a graphic organizer. Students record information on their graphic organizer. One person from each group explains the group's thinking and why they chose their graphic organizer.

Whole Class ➔ Introduce Culminating Task
Introduce the culminating task by explaining that students will select a technology that uses mirrors, lenses, and/or filters. Point out that they will:

- read and gather information about the technology
- keep notes on their technology (i.e., optical device)
- create (draft and revise) a poster which includes
  - an image of the technology
  - an explanation of how the technology uses mirrors, lenses, filters, and/or light
  - an impact statement to explain how society has benefited from the technology and what the costs and/or drawbacks of the technology are

Address any questions about the task requirements. Co-construct success criteria for the task. Each student selects one of the technologies from the anchor chart, based on interest. Address any questions once students have selected, and if needed, allow students to exchange selections. Students set up their project logs to gather information, compile notes, reflect on their learning, and plan their final product.

Consolidation (Elaborate, Evaluate, Extend)

Individual ➔ Reflection
In their project logs, students create a graphic organizer to note

- the technology they've selected
- what they already know about the technology
- what they know from the information on the anchor chart, e.g., a category it is clustered in
- questions they have related to the technology or the culminating task

Pause and Ponder

QuickTip
This clustering is an opportunity to begin an organization which may be revisited later. This should be tentative and flexible as students build understanding.

The anchor chart will be used throughout the unit as a way to connect the lesson to the technology students will use as a focus for their culminating activity.

QuickTip
If necessary, provide students with samples of graphic organizers to guide their selection. See Strategy Implementation Continuum regarding students' use of graphic organizers.

QuickTip
Aspects of the culminating task are integrated in each of the lessons. Throughout the unit, students have opportunities to gather information and plan for their culminating task in Lesson 9.

QuickTip
Use the project log responses to plan for additional information students may need, e.g., readings for Lesson 9, and opportunities to highlight particular technologies in the lessons.
Minds On (Elicit, Engage)

Anchor Chart
An anchor chart is a strategy for capturing students' voices and thinking. Anchor charts are co-constructed. By making students' thinking visible and public, they "anchor," or stabilize and scaffold classroom learning. Anchor charts should be developmentally appropriate and clearly focused, accessible, and organized.

Safety Procedures
Teachers must model safe practices at all times and communicate safety expectations to students in accordance with school board and Ministry of Education policies and Ministry of Labour regulations. Teachers are responsible for ensuring the safety of students during classroom activities and also for encouraging and motivating students to assume responsibility for their own safety and the safety of others. Teachers must also ensure that students have the knowledge and skills needed for safe participation in science activities.

To carry out their responsibilities with regard to safety, it is important for teachers to have:
- concern for their own safety and that of their students
- the knowledge necessary to use the materials, equipment, and procedures involved in science safely
- knowledge concerning the care of living things – plants and animals – that are brought into the classroom
- the skills needed to perform tasks efficiently and safely

Students demonstrate that they have the knowledge, skills, and habits of mind required for safe participation in science activities when they:
- maintain a well-organized and uncluttered work space
- follow established safety procedures
- identify possible safety concerns
- suggest and implement appropriate safety procedures
- carefully follow the instructions and example of the teacher
- consistently show care and concern for their own safety and that of others

Various kinds of health and safety issues can arise when learning involves field trips. Out of-school field trips can provide an exciting and authentic dimension to students' learning experiences. They also take the teacher and students out of the predictable classroom environment and into unfamiliar settings. Teachers must preview and plan these activities carefully to protect students' health and safety.

Action! (Explore, Explain)

Strategy Implementation Continuum
It is important that the teacher model each strategy or skill with a think-aloud before engaging students in shared and guided practice. See the Strategy Implementation Continuum (gradual release model). Provide feedback on effective strategy use as students use the strategy.

Sample Question Prompts for Graphic Organizer
- Who uses this technology?
- What is used for?
- What would they use if they didn’t have it?
- Are there safety concerns with this technology?
- What effect does it have on peoples’ lives?
- What impact would it have if it didn’t exist?
- Where would you see this technology used?
- What are the costs of having this technology?

Co-constructing Success Criteria
Co-constructing criteria is the process of working collaboratively with students to develop the criteria and indicators for successful demonstration of knowledge and/or skills related to learning goal.

See DI Assessment Guide and DI Assessment Cards.

Project Log
Students use a project log to keep a record of their planning and thinking as they work through the various components of the culminating project. The project log can take various forms, for example a small notebook, wiki, or blog. In addition to its function as a planning tool, the project log can include students’ reflections about their content learning and their use of their learning skills. The responses provide assessment information which teachers may want to address in the following lesson.
Optics Performance Culminating Task

Create a poster on an optical device.

Steps
1. Use your project log to identify questions you will use to do more research on your technology.
2. Gather information from the teacher and your own sources of information.
3. Use a R.A.F.T. to clarify your role, your audience, your goal, form of communication, and topic (content).
4. Draft your poster which includes:
   a. an image of your technology
   b. a description of your technology, including how the technology uses mirrors, lenses, filters, light
   c. an impact statement to explain
      i. how we have benefited from the technology
      ii. what are the costs and/or drawbacks of the technology
   d. a reflection, addressing one or more of the following questions:
      i. How has the technology affected or will affect my life?
      ii. How could this technology benefit society in a different way?
      iii. How might the structure of this technology change in the future?
5. Participate in a conference to make revisions and improve your draft.
6. Complete a final version of your poster.
7. Share your poster in a gallery walk.
<table>
<thead>
<tr>
<th>R.A.F.T.</th>
<th>Question Prompts</th>
<th>My Response</th>
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<tbody>
<tr>
<td><strong>Role</strong></td>
<td>I am an expert on my optical device. What is my role as an expert? What do I need to do to be confident as an expert on my topic?</td>
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<td><strong>Audience</strong></td>
<td>Who is my intended audience? What does the audience already know? What do I think my audience will find interesting? What does my audience need to know?</td>
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<td><strong>Form</strong></td>
<td>Poster on an optical device. How will I make my information clear and visually appealing? How will I incorporate: • an image • a description • an impact statement on the benefits • the costs and/or drawbacks of the technology • a reflection How will I produce my poster? What size should my poster be for the gallery walk?</td>
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<td><strong>Topic</strong></td>
<td>What is the optical device/technology I am sharing information about? What are the most important concepts and facts? What can’t be answered? What information have I collected in the project log? What questions will I need to research?</td>
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### Optics Performance Task Rubric

**Note:** Lesson 9 suggests co-constructing criteria that will be used to create a rubric—this rubric is provided as a sample.

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<th>Level 3</th>
<th>Level 4</th>
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<td><strong>Communication</strong></td>
<td>Uses a poster, including image and information, to communicate with a</td>
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<td><strong>Application</strong></td>
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