

Lesson Plan	Coding Tool	Worksheet Pseudocode
	Cross-curricular	Language Arts (Oral Communication)
Big Ideas - Light and sounds are forms of energy with specific properties - Light is required to see - Technological innovations involving light and sound have an impact on the the environment Learning Goals - Identify sources of light in and around the school - Classify sources of light into two categories: natural and artificial - Create a “rule” for defining the difference between natural and artificial light	Specific Expectations 2.5 use scientific inquiry/research skills (see page 15) to investigate applications of the properties of light or sound 2.6 use appropriate science and technology vocabulary, including <i>natural, artificial, beam of light, pitch, loudness, and vibration</i>, in oral and written communication 2.7 use a variety of forms (<i>e.g., oral, written, graphic, multimedia</i>) to communicate with different audiences and for a variety of purposes 3.1 identify a variety of natural light sources (<i>e.g., the sun, a firefly</i>) and artificial light sources (<i>e.g., a candle, fireworks, a light bulb</i>)	
Description This is the first of two lessons in which students use computational thinking and coding to explore the differences between light sources in their environment. Each lesson can be done independently or in sequence. The purpose of this lesson is to use the surrounding environment to help students discover the differences between natural and artificial light.		
Materials - Types of Light pt.1 Handout - Pencils - Chalkboard/Whiteboard - Post-it notes	Computational Thinking Skills Students will have to think sequentially to develop pseudocode for their sorting machine game.	

Introduction

- **Ask:** Working with your elbow partner, answer the question: Why is light important? Write your answer on a post-it note and bring it up to the board when you're done.
- Once each group has placed their answer on the board, ask if any of the groups want to share their answers. If no one volunteers, then read some of the answers on the board and let students know that their names will be anonymous.
- The answer you are looking for is: "We need light to see"
- **Next question:** Are all types of light the same? For our next question we are going to take a walk through the school and the schoolyard and make a list of all different types of light we see.
- Quickly brainstorm how we can be respectful towards the other classes who are trying to work (e.g., we can be quiet, no running in the hallway, stay with our class, etc.)

Action

Inquiry Walk

- Take 5-10 minutes to walk through the school and the schoolyard with the class as they write down a list of all the different sources of light they see

Category Sort

- Once everyone is back in class, return to the question: "Are all types of light the same?" (Written on the board)
- Students can work independently or with their elbow partner to organize their examples of light into different categories
- Explain to students that they are using '*conditional statements*' they are organizing their examples into categories. Computer programs use conditional statements in the same way, as it helps make decisions.
- An example of a conditional statement is the if/else statement. For example: *If* it is raining, pack an umbrella. *Else*, pack sunscreen.
- Conditional statements can be framed as an organizing rule, which the students can use to sort their examples.
- Once students have organized their sources of light, students use the Types of Light pt.1 Handout to record the conditional statement (organizing rule) they used to sort their examples.
- Students share their work with another group, and write down another group's conditional statement. When students have returned to their desks, ask if some students would like to share their conditional statements.
- Ask the class: "Who sorted their light sources into 5 categories", invite students to share. Continue refining categories with student input until you have 2 categories. Guide the conversation so that the class ends up with Natural and Artificial light.

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- As a class, create the conditional statement for natural light. (e.g., **If** the light source is man-made, it's artificial. **Else**, it's natural.)

Let's Build a Sorting Machine!

- In this activity, students are going to create **pseudocode** for their game. Pseudocode is simplified code often written on paper that help programmers organize their ideas. The goal of the student's pseudocode is to sort artificial and natural light into two categories. The pseudocode will be used by students to help them when they program their sorting game on Scratch. (Types of Light pt.2)
- **Ask:** Who has coded before? If students have coding experience, invite them to share what type of things they code for.
- **Ask:** What is important when writing code? Guide students towards the answer: it's important to tell the computer every step it needs to take. Computers aren't able to make their own decisions, we have to make them for the computer.
- **Teacher:** For example, the first thing we need to tell the computer is when to start. So the first step for my sorting machine code is going to be "Start when I say 'begin'" (teacher writes this on the board)
- Using the provided *Types of Light pt.1 Handout*, students are going to design their game, and write pseudocode to describe what their game will do.
- **Teacher:** For this sorting game, we're going begin with many different images of natural and artificial light sources. Next we need to figure out how to sort the images into two categories. If we use a computer mouse we can drag and drop the pictures, but we need to tell the pictures that they need to recognize each other. **For example**, I might have a line of code that says: "when Light bulb touches Artificial box, Light bulb disappears"
- Give students time to draw what they want their sorting game to look like and ask them to write a minimum of 3 lines pseudocode to accompany it. An example of what this may look like is provided in Appendix A.

Consolidation/Extension

Gallery walk

- Students walk around and look at each others' sorting games

Reflection

- Students answer the last two questions on the handout to reflect on the definition of natural and artificial light
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Assessment

The teacher can check for understanding through questioning and class discussion. The teacher can also check for understanding by reviewing the students' worksheet from the lesson.

Appendix A

