

# LUMINOUS SCIENCE LESSON: C3

## READING SENSORS AND COLLECTING DATA

**Instructional Objectives:** Students begin to understand how to use the micro:bit radio and LED array to collect and view data from sensors in the garden. Students will begin to generate ideas for visualizing data related to their investigation questions.

- **Before this lesson** - Complete lesson:  
**A1: History of Nebuta Lanterns and Story Art**  
**S4: Identifying Measurable Variables**
- **With this lesson** - The following lessons can be combined with or taught concurrently with these lessons:  
**S4: Identifying Measurable Variables**  
**S5A: Experiment Design and Variable Manipulation**  
**A2: Connecting Investigation to Lantern Design**  
**A3: Wire Frames**  
**A4: Papering Lanterns**  
**A5: Painting Lanterns**  
**C4A: Data Visualization Techniques**

### TEACHER PREP

**Before completing this activity teachers should:**  
Program a sender micro:bit to send chosen set of sensor data and gather materials.

### STUDENT PREP

**Before completing this activity students should:**  
Be comfortable creating simple micro:bit programs and be able to use the micro:bit radio. Additionally students should have identified and developed an investigation question.

# MATERIALS LIST:

- Classroom Supplies**
  - Lab notebook or journal
  - Pencils and colored pencils
  - Markers
  - Paper
  
- Luminous Science Garden**
  
- Micro:bit(s) and USB cable(S)**
  
- Computers with internet browsers**



## STANDARDS

### Studio Arts

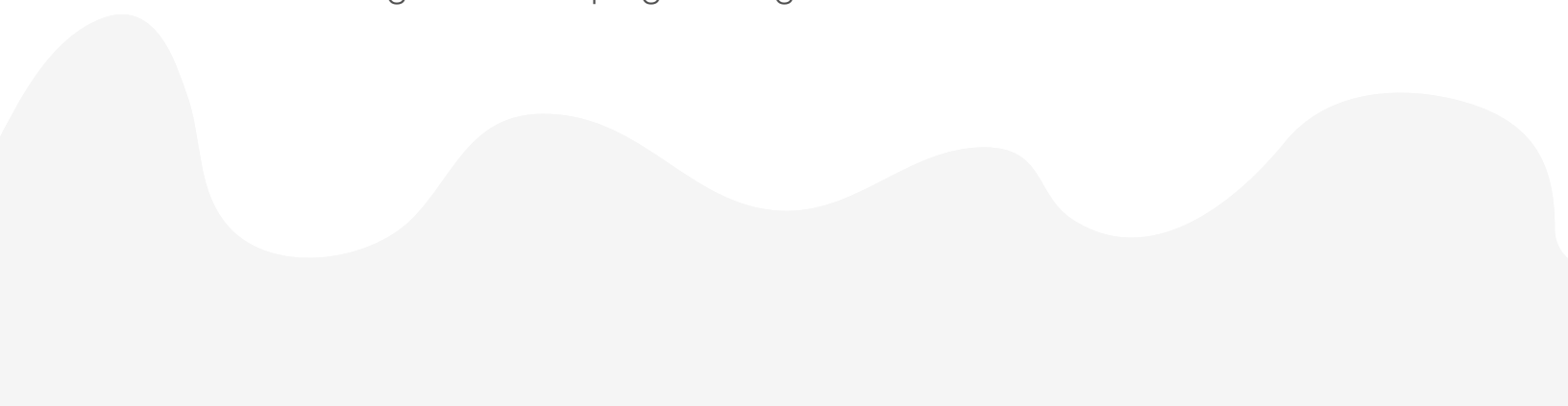
Envision  
Express  
Reflect

### K-12 CS

Networks and the internet  
Data and analysis  
Algorithms and programming

### NGSS

MS-LS-5  
MS-LS1-6  
MS-LS2-1  
MS-LS2-3  
MS-LS2-3  
MS-ETS1-2



## ACTIVITY INSTRUCTIONS:

10

As a class, pick one sensor to explore and collect data from such as soil moisture level or temperature.

5

Encourage students to conduct a preliminary physical investigation of the variable that the class has chosen to investigate. Ex: if the variable is soil moisture, ask students to explore this variable through their senses. *Does the soil look dry? Does it feel dry?* Have students share and record their observations.

Have a class discussion about the differences between having a person collect data and having a sensor collect data. Why do we need sensors? How do we benefit from them? Ex: A person cannot collect and record data 24/7, a sensor can. Explain that people can write programs to collect and visualize data from sensors.

Prompt students to brainstorm ideas as a class for a program that can collect data from the class selected sensor. Ask students to consider which features their programs will need. Example question prompt for students: The micro:bit sender sends lots of different types of data, how do you make sure that your micro:bit receiver is receiving only the data you want?

10

As a class or in small groups, write pseudocode for this program. Have students create a program that actually collects the data from the sensor the class selected. Students can write their own code or make changes to example code. (see provided resources)

5

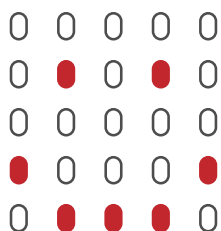
Ask students to revisit their final project investigation questions and to pick one variable from their question that they could use the sensors to collect data about. Provide students with a list of the sensors that you have set up in your garden.

5

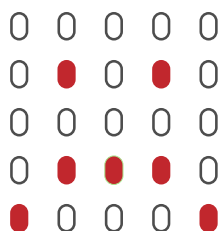
Ask students to come up with reasons why numbers scrolling across an LED array might not be the best way to visualize data. Ex: the LED array can be difficult to read. Have students think about better ways to use the LED array to visualize data their sensor data.

MINUTES

Ex: If you were investigating how temperature affects plants in the Luminous Science garden and you wanted to show that plants are negatively affected when the temperature is less than 70° F you could visualize this on the LED array like this:



If the temperature is > 70° show a smiley face on the LED array



If the temperature is < 70° show a frowny face on the LED array

15

As a class discuss this example. What does it do well? How could it work better? Ex: This representation doesn't show how the plants health is affected if the temperature is greater than 90° F. The micro:bit LED array would show a smiley face but the plant could be negatively affected at that temperature.

Come up with a list of characteristics that are important for making good data visualizations using the micro:bit LED array. Ex: it's easy to look at and you can read it quickly.

Ask students to sketch out their ideas for visualizing data related to the variable they selected from their investigation question earlier using the micro:bit LED array. Use the LED array sketch sheet (see resources). Encourage students to come up with multiple ideas.

After students have sketched their ideas, ask them to share their favorite idea with the class or in small groups.

5

After sharing, give students time to reflect. Prompt them to think about if there are more things they could add to the class list of characteristics of good data visualizations, what the limitations are of the LED array, and what ideas it sparks for their lanterns.