LUMINOUS SCIENCE LESSON: S4

IDENTIFYING MEASURABLE VARIABLES

Instructional Objectives: Students develop an investigation question, plan and hypothesis for a final project investigation. Students identify measurable variables for their investigation question using hand measurements and sensors.

- **Before this lesson -** Complete lessons:
  C2: Networking Using the Radio with Garden Data
- **With this lesson -** The following lessons can be combined with or taught concurrently with these lessons:
  S3B: Plant Research and Discussion
  S5A: Experiment Design and Variable Manipulation
  S5B: Variable Correlation
  A2: Connecting Investigation to Lantern Design
  C3: Reading Sensors and Collecting Data Using Conditionals

TEACHER PREP

Before completing this activity teachers should:
Cut the feedback worksheet into sections and gather materials.

STUDENT PREP

Before completing this activity students should:
Participate in observations of the garden, have a class investigation set up, and have a general group investigation question to answer.

MATERIALS LIST:

- **Luminous Science Garden**
- **Classroom Supplies**
  - Lab notebook or journal
  - Pencils
  - Paper

STANDARDS

NGSS

Practice 3
MS-LS1-1
MS-LS1-2
MS-LS1-4
MS-LS1-5
MS-LS1-6
MS-LS1-7
MS-LS2-4
MS-ETS1-2

ACTIVITY INSTRUCTIONS:

MINUTES	
5	Ask students to share out their final project investigation questions.
5	Discuss what a variable is, and the difference between dependent and independent variables. Prompt students to brainstorm a list of all of the variables they can think of related to their questions as a group.
10	Discuss what is measurable and how it is measured (example: by hand measurements, quantitative or qualitative observations, sensors). Discuss this in the context of the current class experiment.
15	Ask students to refine their planned final project investigation to include measurable variables, a hypothesis on how those entities interact, what they expect them to do over time, units for the variables, and an explanation of why those are the best things to measure for their investigation question.
15	Have students give feedback to each other on their investigations by using the peer feedback worksheet. (3 pairs of groups get together, 5 minutes per group)

An example of sensors being used in an ecosystem. In this picture soil moisture, soil temperature, air temperature, and light levels are being measured using the weather:bit and micro:bit