

Unit Overview:

In this unit, students will learn how to incorporate digital and analog sensors to robotic builds and projects. Students will learn how to write custom programs that include conditional statements such as **if statements** and **if/then statements**.

Recommended Grade Level:

4 - 8

Kid Spark STEM Lab:

Engineering Pathways

Alignment to STEM Standards:

The table below highlights how this unit is aligned to the Next Generation Science Standards (NGSS) and the International Society for Technology in Education Standards (ISTE).

- ⚙️ NGSS Disciplinary Core Ideas (DCI) are standards related to content knowledge.
- ⚙️ NGSS Science and Engineering Practices (SEP) and Crosscutting Concepts (CCC) provide a foundation for all scientific and engineering disciplines and are particularly important to develop in young students.
- ⚙️ ISTE standards are designed to prepare students to thrive in a constantly evolving technological landscape. [Click here](#) to view ISTE standards.

Lessons & Assessment	NGSS DCI	NGSS SEP	NGSS CCC	ISTE
Lesson 1: Digital vs. Analog Sensors (60 Min.) In this lesson, students will learn the difference between digital and analog sensors. Students will also learn how to use the serial function in Arduino to observe data from sensors that are connected to the ROKduino.	Engineering design	Analyzing & interpreting data	Patterns	Innovative designer, Computational thinker
Lesson 2: If Statements (120 Min.) In this lesson, students will learn how to create a sketch that utilizes if statements. Then, students will build and program a custom design that relies on an if statement to function correctly.	Engineering design	Developing & using models	Cause & effect: mechanism & explanation	Innovative designer, Computational thinker
Lesson 3: If/Else Statements (120 Min.) In this lesson, students will learn how to develop a sketch that uses if/else statements. Students will observe how if/else statements can be used with digital and analog sensors to control a simple design.	Engineering design	Using mathematics & computational thinking	Systems & system models	Innovative designer, Computational thinker
Lesson 4: Creating a Light Gate (120 Min.) In this lesson, students will learn how transmitters and receivers can be used to create light gates. Students will build a simple mechanism and create a series of new sketches to control the design.	Engineering design	Planning & carrying out investigations	Structure & function	Innovative designer, Computational thinker
Lesson 5: Creating a Proximity Sensor (120 Min.) In this lesson, students will learn how transmitters and receivers can be used to create a proximity sensor. Students will build and test a simple proximity-sensing device, then create a custom build of their own design.	Engineering design	Developing & using models	Structure & function	Innovative designer, Computational thinker
Lesson 6: Free Build Challenge (60 - 120 Min.) In this lesson, students will apply the knowledge and skills they have acquired throughout the Exploring Sensors unit to develop a custom design or invention.	Engineering design	Constructing explanations & designing solutions	Scale, proportion, & quantity	Innovative designer, Computational thinker

Unit Assessment: Exploring Sensors

In this performance-based assessment, students will complete a series of tasks as they demonstrate their understanding of the core ideas and concepts that were covered throughout this unit.

Target Vocabulary

The following key terms will be used throughout this unit. It may be helpful to explain these terms as they show up in lessons and challenges.

Analog Sensors - A sensor that can produce or convey a range of values.

Digital Sensor - A sensor that has only two states: on (true) or off (false).

Serial Monitor - A visual monitoring tool within Arduino that allows you to view data being sent from the ROKduino.

If Statement - A conditional statement that is used to execute a set of commands if a condition or test is true.

If/Else Statement - A conditional statement that is used to execute a set of commands if a condition or test is true. If the condition or test is false, another set of commands is executed.

Light Gate - A digital sensor that uses a transmitter to “transmit” a constant infrared (IR) signal to a receiver. When objects interrupt the signal, the sensor returns a value of 0 (off, false). When no objects are interrupting the signal, the sensor returns a value of 1023 (on, true).

Proximity Sensor - A digital sensor that uses a transmitter and a receiver to detect or “sense” nearby objects. When an object is detected, the sensor returns a value of 1023 (on, true). When no objects are detected, the sensor returns a value of 0 (off, false).



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