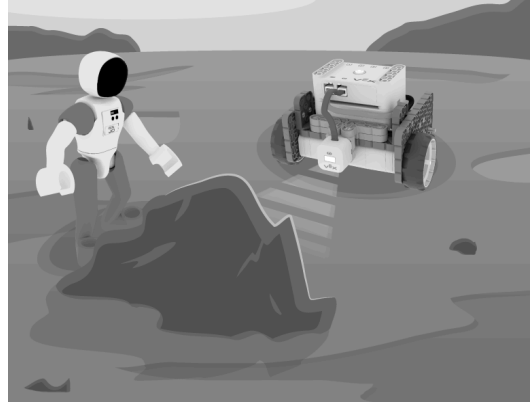


Mars Rover: Landing Challenge Letter Home

Introduction

In the Mars Rover: Landing Challenge STEM Lab Unit, students will explore using the Eye Sensor with the Code Base, by creating projects in VEXcode GO inspired by actual challenges faced by scientists when landing spacecraft on Mars.

Students will be introduced to some of the elements of Mars rover missions that are currently underway, like detecting obstacles in a landing area and diverting the landing accordingly. The coding challenges in this Unit will use the Eye Sensor on the Code Base to mimic activities of the real Mars rover landing, by creating projects in VEXcode GO to detect obstacles, and clear a landing space.



Students will explore the question - *How do I solve a challenge with the Code Base and VEXcode GO?* In this Unit, students will use VEXcode GO, a coding platform on a computer or a tablet, that enables students to drag and drop blocks to build a project that can be carried out by the Code Base. Students will first code their Code Base to detect obstacles, using the Eye Sensor, in Lab 1, through guided exploration as a class. Students will experiment with the way the Code Base needs to turn in order to find obstacles in various locations. In Lab 2, students will apply what they learned in Lab 1, and add a loop to their project, so that the Code Base can detect multiple obstacles, to successfully clear the landing space.

Please keep this letter for your reference as your student works through the Mars Rover: Landing Challenge Unit. It contains information that you can use to keep up to date on what students are learning and to spark discussions about Computer Science and coding at home.

Look Inside the VEX GO STEM Lab Unit

In **Lab 1: Detect Obstacles**, students will first talk about the challenges of landing a spacecraft on Mars, and the need to look for obstacles that might be in the way. They will then be introduced to the Eye Sensor on the Code Base, and how that can be coded in VEXcode GO to drive and detect an object. Students will then build a project

Mars Rover: Landing Challenge Letter Home

together, as a class, to drive around the GO Field (the landing area) and detect obstacles in the path of the Code Base.

In **Lab 2: Clear the Landing Area**, students will build on their experience in Lab 1, and will be encouraged to use a loop in their project, so that their Code Base can continue to travel around the entire landing area to detect obstacles. They will experiment with the turning angles in their project as well so that their Code Base can detect obstacles in any location on the landing area.

Vocabulary

General notes on encouraging vocabulary usage with children:

The vocabulary words offered are not meant for students to memorize terminology, but to give them language to use to talk about the activities and learning they are doing throughout the Unit. Work these terms into conversations naturally, and positively reinforce this for students as well.

The names of VEXcode GO blocks that are included in the vocabulary are meant to help students learn the names of the blocks they are using so that they are able to refer to those blocks correctly when building future projects. Ask students about how they used these blocks in their projects, and what they say or heard the Code Base robot do with each block, to help them build their VEXcode GO vocabulary.

- **Mars** - The fourth planet from the Sun, often referred to as the “Red Planet.”
- **Detect** - To identify the presence of something.
- **Obstacle** - An object that blocks your path.
- **Eye Sensor** - A type of sensor that detects if there is an object present, the color of the object, and the brightness of light.
- **VEXcode GO** - A programming language used with VEX GO robots.
- **{When started} block** - Begins running the attached stack of blocks when the project is started.
- **[Wait until] block** - Waits for the condition inside of it to report true before moving to the next block.
- **[Drive] block** - Moves the Drivetrain forward or in reverse forever.

Mars Rover: Landing Challenge Letter Home

- **[Forever] block** - A 'C' block that repeats any blocks contained inside forever.
- **[Repeat] block** - A 'C' block that repeats any blocks contained inside a set number of times.
- **[Turn for] block** - Turns the Drivetrain for a given distance
- **<Found object> block** - Reports if the Eye Sensor detects an object.

Connection to Daily Life

In this Unit, students are introduced to the concept of sensors, by using the Eye Sensor on the Code Base, to detect objects in its path. Like humans use their senses to learn about the world around them, robots use sensors to gather data about their environment. This information can then be used to cause something else to happen — like causing a color on the LED Bumper to glow, or moving in a different direction. These kinds of cause and effect scenarios happen in many devices and technologies we come in contact with each day, as well as many situations we encounter in our own activities. Think together with your student about a time that sensory information caused something to happen for yourself. Then see if you can connect that to a technological device that uses a sensor. For instance, we saw that it was raining so we got our umbrella before going outside. Our thermostat sensed that it was cold, so it turned the heat on.

Through the coding explorations in this Unit, students will need to think about the ways their Code Base robots will need to drive and turn, in order to cover the entire landing area. This kind of predicting, describing, and mental mapping of the desired paths of the robot, will help students to build their spatial reasoning skills. We often create mental models of things in our daily lives, without even realizing it. Help your student to practice these skills with fun challenges, like trying to set the table with closed eyes, writing a word or name while looking at something else, describing the steps to complete a math problem verbally, or giving you directions to something in your home with words and gestures.

Mars Rover: Landing Challenge Letter Home

Follow-up questions to ask at home

Use these questions to discuss the activities that your student is participating in with their group. Included here are questions that address the trial and error that is an essential part of building and coding. It will likely take several tries for your student to create their VEX GO Builds and create successful coding projects. Asking process-oriented questions and celebrating mistakes can encourage learners to embrace making mistakes and help them build resilience and confidence to persist when confronted with challenges.

1. How did your Code Base detect an obstacle?
2. What part of the challenge was the most fun for you and your group? Why?
3. What part of the challenge took your group a few tries to get right? What did you learn from trying again?
4. What do you think happens on Mars that makes it difficult for real rovers and spacecraft to land? How do scientists solve those problems?
5. How were you a problem solver with your group?
6. What is something you know about coding your Code Base now, that you didn't know before this challenge? How can you use that in the future?