



The Power of (STEM)² Podcast Lessons

Dear STEM Teachers – This free lesson plan comes from the educational podcast (STEM)² on NASA’s Artemis 2 program and is designed for 3rd-8th Grade learners with a sample NGSS standard. [Click here for more Artemis lessons & resources.](#)

(STEAM)² Sample Lesson #2: VEX Robotics Lunar Challenge

Grade Level: 2nd to 5th Grade

Duration: 40 minutes to 1 hour (single or two day lesson)

Note for Teachers: Teachers may need to introduce the robots before starting the lesson. This lesson is based on the VEX 123 robots which are primarily used in the early grades or for short educational scenarios and lessons with older grades like this lesson ([click here for VEX 123](#)). Students and teams should be familiar with basic VEX programming before introducing this science and engineering challenge. Teachers may want to explore lunar environments and stations astronauts might construct and live in when working on the Moon as part of constructing the lunar course for VEX robots to navigate in.

NGSS Standards:

- **2-ETS1-1:** Ask questions, make observations, and gather information to define a simple problem.
- **3-ETS1-1:** Define a design problem that can be solved through the development of a new or improved object, tool, or process.
- **4-ETS1-2:** Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.
- **5-ETS1-3:** Analyze data from tests to determine similarities and differences among the designs (coding solutions).

Objectives:

1. **Programming Skills:** Students will program VEX 123 robots to navigate a lunar landscape and find a hidden astronaut.
2. **Problem-Solving:** Students will work in teams to develop strategies for locating the astronaut.
3. **Team Collaboration:** Students will enhance communication and teamwork skills throughout the challenge.

Materials Needed:

- VEX 123 robots (one per team)

- Lunar board (flat surface with craters and obstacles)
- Astronaut figure (small toy or printed picture) or other space objects (probe, robot, etc)
- Markers or cones (to create obstacles)
- Whiteboard and markers (for planning)
- Tablets or laptops with VEXcode 123 software (optional)

Challenge Instructions & Setup – Create a scenario where an astronaut needs rescued or special lunar equipment. You can also have students imagine other scenarios where a lunar robot might be needed to find lunar objects, probes, etc.

Step 1: Prepare the Lunar Board (5-10 minutes – Basic VEX board should be ready before adding lunar features)

1. **Create the Board:** Set up a flat surface to represent a lunar landscape. Use markers or cones to create various obstacles (craters, hills).
2. **Hide the Astronaut:** Place the astronaut figure (or other lunar space object) in a designated area on the board in a challenging area to get to because of the lunar surface.

Step 2: Team Formation (5 minutes)

1. **Divide the Class:** Split students into teams of 3-4.
2. **Assign Roles:** Encourage teams to assign roles (e.g., programmer, navigator, tester) to promote collaboration and effective teamwork.

Step 3: Brainstorming and Planning (10 minutes)

1. **Discussion and Planning:**
 - Teams gather around a whiteboard to discuss their approach.
 - They should outline their plan for getting their robot will take to find the astronaut, considering obstacles on the lunar board. Older grades can discuss and write out their VEX 123 codes (see below) as well.
 - Encourage teams to ask questions and think critically about the challenge.

Step 4: Programming the Robot (10 minutes)

1. **Code Development:**
 - Teams use the VEX 123 robot and its programming interface to code their robot to:
 - Move forward

- Turn left/right
- Stop
- Perform a designated action upon locating the astronaut (like spinning or signaling).
- Emphasize the importance of testing and iterating their code as needed.

Step 5: Testing Runs (5-10 minutes)

1. **Run the Programs:** Each team takes turns running their robot on the lunar board to search for the missing astronaut.
2. **Adjustments and Reflection:** After each attempt, teams should discuss what worked and what didn't, considering how they can improve their programming.

Wrap-Up and Reflection (5 minutes)

1. **Class Discussion:**
 - Gather students to share their experiences and findings.
 - Ask reflective questions:
 - What strategies worked best for locating the astronaut?
 - How did your team collaborate during the challenge?
 - What changes would you make if you could do it again?
2. **Celebrate Teamwork:** Recognize all teams for their creativity and problem-solving efforts.

Assessment:

- **Participation:** Observe engagement and teamwork during the challenge.
- **Effectiveness of Programming:** Evaluate how well the robots navigated the lunar board and found the astronaut or other lunar objects.
- **Collaboration Skills:** Assess how well teams communicated and worked together throughout the challenge.

Extensions:

- **Advanced Challenge:** Introduce additional astronauts to find or create new obstacles.
- **Design Challenge:** Have students design a new lunar landscape for future challenges using available materials.

This engaging and hands-on challenge encourages students to apply their programming skills while promoting critical thinking, collaboration, and problem-solving in a fun and interactive way.

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