Working on Mars

Objective: Students are building a rover to accomplish their mission goal using Zoob builders in one activity. They will also program an Ozobot to accomplish tasks on Mars.

Materials Needed:

- Activity 1 – Zoob Rover Build
  - Zoob builders
  - Camera or phone (if taking pictures of rovers)
- Activity 2 – Ozobot Programming
  - Ozobot
  - Markers (black, red, green, blue)
  - Mars terrain map
  - Pencil

Summary of Student Action:

Activity 1 – Zoob Rover Build

Students will be selecting a mission goal and, using Zoobs, building a rover that they believe will accomplish that goal. The rover must have wheels, a place for an astronaut, and any tools necessary for their mission, but the overall design can be left up to the student. When they finish, they will bring it to a staff member, who will take a picture and mark their passport.

Activity 2 – Ozobot Programming

An object has created a new crater on Mars. It is important to get to the crater to study the land that got unearthed. They will do this using an Ozobot that needs to be programmed and a map of Mars terrain, with several locations highlighted. While the rover is out, they also want to complete other research; they will collect a rock sample, complete radiation testing, collect water, and refuel the rover before returning to the Mars base. Students need to go to the crater first and then must refuel their tanks after two tasks, but can complete the remainder of the activities in any order.

Students should first create a path using their pencil. Once they have decided on the routes, they can be programmed. The Ozobots are programmed using black markers; the Ozobot will follow the black lines. When the Ozobot comes to an intersection, it needs to be told which direction to go in (or it will go in a random direction). The codes for each turn are on the Mars terrain map and should be put in place of the black line about two inches before the intersection. Students should plan ahead in pencil, so they know when to switch colors when finalizing the coding with markers.

Students can time how long it takes their rover to complete all the tasks and record it on a leader board.

Setup Instructions:

- Activity 1 – Zoob Rover Build
    - Place the Zoob builders out on a table. Separate out the Rover specific pieces and distribute them in different locations at the stations. Spread the standard building pieces throughout the station.
    - Prepare a camera or a phone to take photos of the students.
- Activity 2 – Ozobot Programming
    - Create a few example versions of a Mars terrain map that has been "programmed" with turns for students to use.
    - Set out the Mars terrain maps, the Ozobots, and the markers. Alternatively, you can have a facilitator hold the Ozobots until a student has shown that they are ready to use them.
    - If doing a leader board, create a space for students to record their times and put out stopwatches.

Additional Notes:

- Activity 1 – Zoob Rover Build
    - Because the Rover pieces are limited, be sure that students are moving through the station at a good pace to allow other students to use them.
- Activity 2 – Ozobot Programming
    - There are calibration sheets in the Ozobot box. You may need to quickly recalibrate them every so often throughout the day.
    - It's important that the students do not make turns that are too sharp.
    - Students may need help understanding which order to put the colors in if they are programming a turn. It is also important that the direction is coded far enough in advance of the intersection. There should be about one inch between the last color and the intersection.
    - To properly program the intersections, it is especially important for students to outline the path in pencil beforehand.

PHASE FIVE: WORKING ON MARS

Once you are on Mars, the work does not stop! You will be conducting research on many aspects of Mars, ranging from studying rocks to searching for past water activity to looking for clues as to the environmental conditions that existed in the past. Rovers are very useful for completing tasks in remote locations; some missions will be unmanned, so the rovers need to be programmed before the mission, while others may be manned. Your task is to build the manned rover and program the unmanned rovers.

There are two activities in this phase:

- *Rover Build*
- *Ozobot Rover Programming*

Build your manned rover!

Directions:

1. Select a mission goal. It can be one listed below or another one:

- Mission Goal 1: Measure radiation levels of several locations on Mars
- Mission Goal 2: Analyze rocks and dirt to search for past water activity on Mars
- Mission Goal 3: Look for geological clues as to the environmental conditions that existed when liquid water was present on Mars

2. Use the Zoob builders to create a manned rover that will accomplish your mission goal. The only criteria are that there should be a place for a crew member and the rover needs wheels.

3. Once you have completed your rover, collect your passport stamp.

Program your rover!

A new crater was just created near the Mars base! You need to send a rover out to analyze it as soon as possible. While the rover is out, it should be programmed to perform many additional tasks. In addition to reaching the crater, it needs to do the following before returning to the Mars base:

- *Collect water for processing*
- *Extract rock sample for analysis*
- *Take reading from the radiation sensor*
- *Re-fuel at the fuel tanks*

You can create any path you want but there are THREE restrictions:

1. The top priority is to get to the Crater Analysis first.
2. Your rover can only complete TWO tasks before it must re-fuel at the fuel tanks.
3. Don't forget to have your rover return to the Mars base!

Supplies:

- Ozobot
- Mars Terrain Map
- Markers

Directions for Coding:

1. Use your pencil to lightly plan and sketch a path for your rover to take.

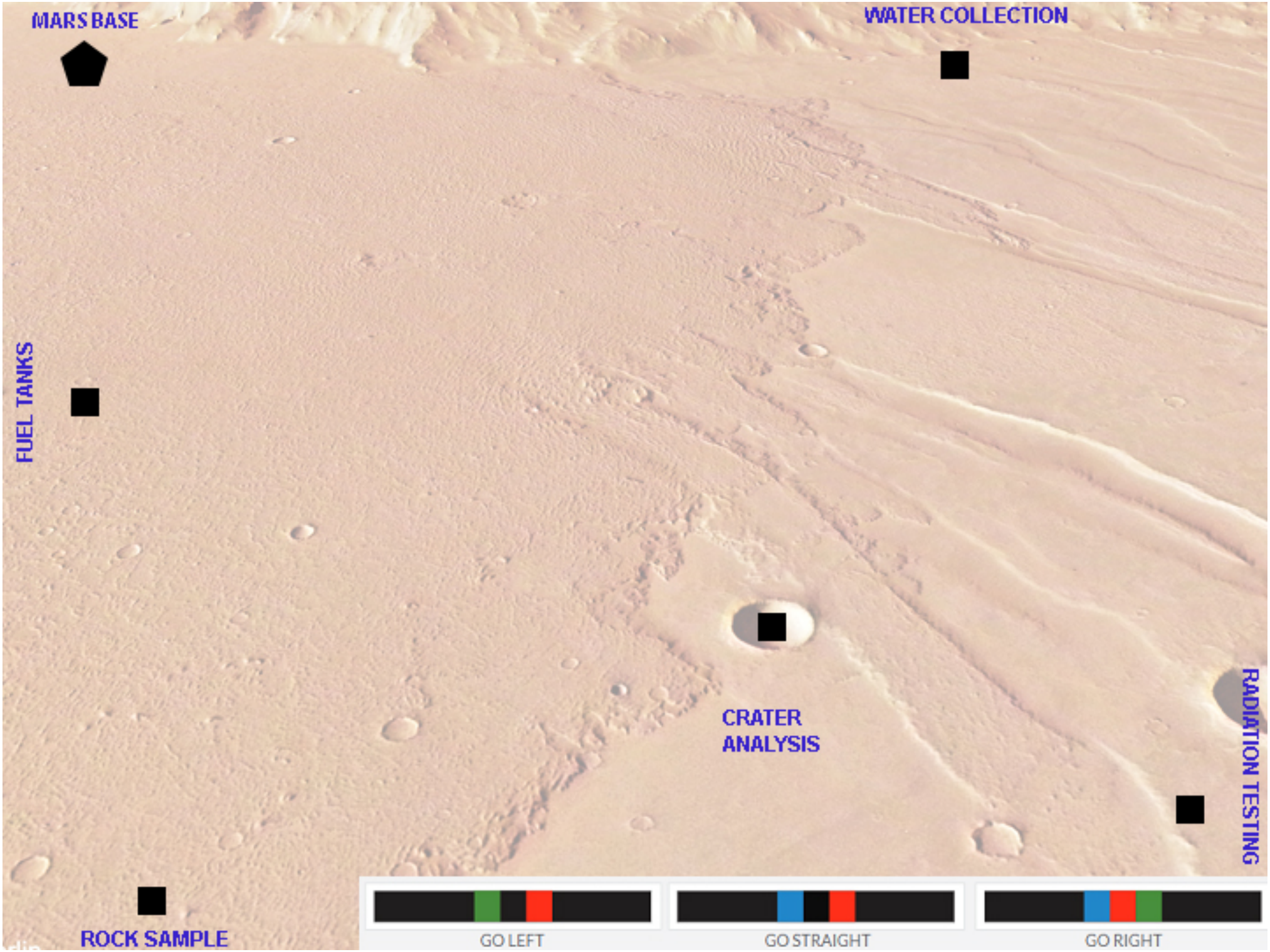
2. If your rover comes to an intersection, use one of the three directional codes on the Mars Terrain Map to tell the rover which way to go. The code should end at least 1-inch before the intersection.

3. When you have finalized the path, use the black marker to code it. The line should be about 1/2 inch thick. See the example. Don't forget to use the different colors f or coding directions.

4. When you have programmed the path, place the Ozobot onto the path to test out the route. Press the button on the side and the Ozobot will begin moving on the path. Make any necessary edits if the path does not accomplish all tasks. Keep trying until the Ozobot completes all tasks.

5. Use the timer to time how long it takes to accomplish all the tasks.

6. Report your time to a staff member and receive a passport stamp.


MARS BASE
WATER COLLECTION
FUEL TANKS
CRATER
ANALYSIS
RADIATION TESTING
ROCK SAMPLE
GO LEFT
GO STRAIGHT
GO RIGHT