



Mission 1: Mars Surface Excavation

Background:

Students will build and program a robot while creating a plow of their own design to clear the simulated Martian surface for a future Mars habitat. Students will have to problem solve and decide whether to try to clear as many “rocks” as possible in a few sweeps, or to clear the “rocks” gradually away in many sweeps. Students will have to work as a team in order to be successful.

Objectives:

Grades 7-8:

Teams will clear a portion of the Mars surface that will serve as both a landing site for the human crew and the construction site for their Mars Habitat. The team will construct a plow of their own design to clear a 9 square foot surface area as quickly as possible.

Mission Activities:

- Learn the basics of designing a plow for the Mars Rover.
- Experiment with student built plow designs
- Problem Solve to devise the best strategy to clear the surface.
- Demonstrate the Keep it Simple method of engineering as it relates to the student designed plows.
- Demonstrate the concept of over-engineering as it relates to the student designed plows.
- Once a Rover and plow can effectively clear the field, expose students to the concept of “If it’s not broken, don’t fix it!”
- During the mission, stress the importance of teamwork and good sportsmanship!

Process Skills:

- **Math**
 - Problem solving
 - Communication
 - Reasoning
 - Estimation
 - Measurement
- **Science**
 - Observing
 - Measuring
 - Experimenting

Procedure:

1. Discuss with students the need for a programmer, a designer, a tester, a builder, and other jobs related to the completion of the robot.
2. Students will think about which aspect of the task is more appealing to them.
3. Students will follow the instructional video on building the robot.
 - a. Students will take turns putting pieces together in the building of the robot.
4. Instruct students on the basics of programming the robot with the Mindstorms software.
 - a. Show how to make the robot move forward and backwards.
5. Students will program the robot to move forward and backwards.
6. Students will design and build a plow for the front of the robot.
7. Students will test their design.
8. When students are ready the robot will try to complete the mission.