Mission 2: Mars Surface Scan

Background:
Now that the simulated Martian surface has been excavated, the Rover is ready to scan the surface for illuminated light. In this way Students will be able to determine if the proposed habitat site is suitable for a solar power station.

Students will perform a scan with their Rover and once the data is analyzed, students will collaborate and submit an oral report of their findings.

Objectives:
Grades 7-8:
Students will collaborate to scan the Martian surface to determine the best location for a solar array to meet the power needs of the future Mars Base. Teams will utilize *Mindstorms NXT Data Logging* to scan, upload, and interpret graphical information obtained from the Mars Rover. The information will be used to determine the location and surface area that is suitably illuminated for the solar array field.

Mission Activities:

- Learn how to utilize the Initialize Light Sensor, Start Data Logging, Wait for 100 Data Points, and Stop Data Logging commands.
- Learn how to write a program to collect 100 data points of light values at a rate of 1 data point every 0.02 seconds.
- Calculate the time of the scan given the number of data points and the rate of data collection.
- Measure the distance and time the Rover Traveled and calculate the speed (rate)
- Learn how to upload the data to the computer
- Learn how to interpret the Light Data versus the time it was collected.
- Graphically identify the time interval the Rover detects light.
- Given the rate (speed) the Rover travels use the distance formula to determine the distance over which light was detected.
- Calculate the diameter of the illuminated surface.
- Calculate the radius of the illuminated surface.
- Utilize the formula for the area of a circle to calculate the area of the illuminated surface.
- Using the data collected by all teams, determine if the illuminated surface is adequate for a solar power station.
- Discuss how the use of “bad” data can be used to prove the illuminated surface is suitable for a solar power station.
- Discuss the implications for a future Mars habitat if the solar power station does not have an adequate light source.

Process Skills:

- **Math**
  - Problem solving
  - Communication
  - Reasoning
  - Numbers and number relations
  - Computation and estimation

  - Measurement
- **Science**
  - Observing
  - Measuring
  - Inferring
  - Predicting
  - Interpreting data
  - Experimenting
  - Communicating
  - Hypothesizing
  - Making models
  - Investigating

Vocabulary:
Data: Numerical or other information represented in a form suitable for processing by computer.
Distance Formula: If the rate and time are known, the distance can be calculated by multiplying the rate by the time.
Diameter: A straight line segment passing through the center of a figure, especially of a circle or sphere, and terminating at the periphery.
Radius: A line segment that joins the center of a circle with any point on its circumference.
Circumference: The boundary line of a circle.
Pi: A transcendental number, approximately 3.14159, represented by the symbol π that expresses the ratio of the circumference to the diameter of a circle and appears as a constant in many mathematical expressions.
Squared: To raise (a number or quantity) to the second power.
Area of a Circle: If the radius of a circle is known, the Area can be calculated by multiplying Pie by the radius squared.

Procedure:
1. Discuss the need for the Mars rover to need to recharge in a direct sunlight.
2. Students will install the light sensor.
3. Students will learn to program the robot to collect data.
   a. Students will need to decide how long to collect data to 100 points.
   b. Students will need to program the robot to stop after collection the 100 data points.
4. Students will test their design.
5. When students are ready the robot will try to complete the mission.
6. Students will analyze the data by completing the Mission Journal.