TEACHER PAGE

# LOOOONG DISTANCE COMMUNICATION

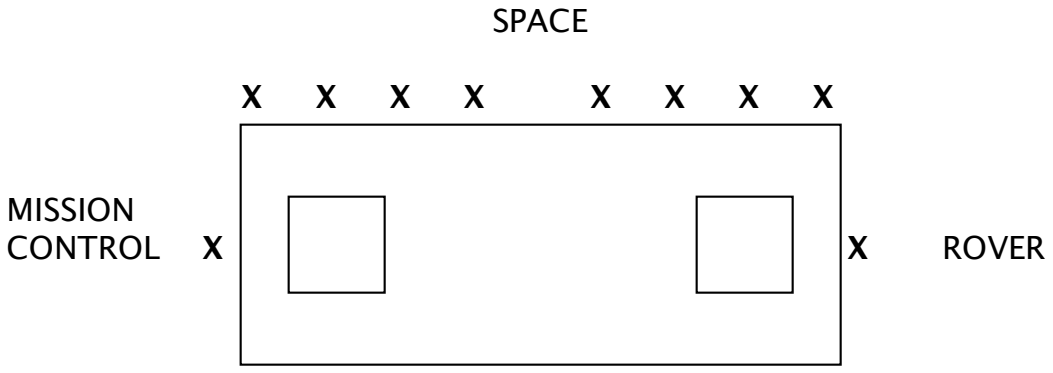
**Background Information**
When NASA's Mission control communicated with astronauts on the Moon, they used radio waves. It took time for signals to get there and time for responses to be received back on Earth. The distance between the earth and moon averages about 237,000 miles. The time delay was barely noticeable—about 1 second. The further the distance, the longer the delay.

When scientists communicated with the Pathfinder spacecraft and Sojourner rover on Mars, communication timer averaged 17 minutes. That is 17 minutes for a simple command such as "turn right" to reach the rover.

**Objectives**
Upon completion of this activity, students will be able to:
- give and receive directions to complete a task.
- work together to complete a task.

**Instruction Time**
45 Minutes

**Materials**
Copies of map (map can be enlarged, or laminated)
Markers
Rulers
Cardboard dividers
Long tables or desks arranged as such



TEACHER PAGE

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**Procedures**

Note: This activity can be done as a group activity (groups of no more than 10), or a classroom can be divided into 2 or 3 teams, depending on size. It can also be done as a competition.

1. Each person in each group will be designated as MISSION CONTROL, the ROVER and SPACE at some point during the activity.
2. Participants will be in a line around the table, with one person at the head of the table as MISSION CONTROL, another at the foot of the table as the ROVER. MISSION CONTROL has a marked (shows the path of the ROVER) or unmarked (student determines the path) map. MISSION CONTROL should be behind the first cardboard divider.
3. A line of participants designated as SPACE will then fill in the area between MISSION CONTROL and the ROVER.
4. The ROVER is also located behind a divider with a blank copy of the map.
5. MISSION CONTROL determines the first move in one of three ways: 1) going rock to rock; 2) using a ruler and measuring distance and direction; 3) using protractors and vector angles. **THE DIRECTIONS CAN ONLY BE SAID ONE AT A TIME**.
6. The message is passed down from each SPACE person to the next until it reaches the ROVER on the end. Passing the message through the long line of SPACE simulates the time and space that a message travels to get to a space vehicle.
7. When the ROVER has finished performing the directions, he/she walks to the front f the line to replace the MISSION CONTROL as everyone shifts one place down.
8. The new MISSION CONTROL determines the next task that needs to be performed and send the message down the SPACE line. Everyone continues to shift one space after each set of instructions is completed.
9. The game continues until:
    a. all moves on the marked map have been completed OR
    b. everyone has been MISSION CONTROL, SPACE, and the ROVER OR
    c. a time limit has expired.

NOTE: Participants may have to back track with some instructions, when the ROVER turned MISSION CONTROL realized an error has been made—this causes a delay.

TEACHER PAGE

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**Discussion**

- How can speed and accuracy be increased when communicating across "space?"
- What types of errors caused communication difficulties? (messages too long or too short, messages misinterpreted, wrong unit of measurement, etc…)
- What other interference can occur as a message travels to Mars?

**Assessment**

Groups should be graded on both the speed and accuracy of the ROVER'S path, after the two maps have been compared. Try several rounds to compare improvements in technique or increase difficulty by following another method of transmitting directions (angle, direction, etc…)

TEACHER PAGE

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