

Lesson 11: Program It!

This lesson is adapted from the “Write It, Do It” event, which is part of *Science Olympiad*.

(<http://www.scioly.org/eventpages/writeitdoit.html>)

Purpose: To introduce students to the fundamental communication skills necessary for successful robotic programming.

Standards

NCTE/IRA Standards for English Language

Arts

Standard 4- Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a wide variety of audiences and for different purposes.

Standard 5- Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.

Standard 12- Students use spoken, written, and visual information to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).

National Science Education Standards

Science as Inquiry – Content Standard A

1. Abilities necessary to do scientific inquiry.
2. Understanding about scientific inquiry.

Science and Technology – Content Standard E

Abilities of technological design – student abilities should include oral, written, and pictorial communication of the design process.

Overview

Though it is still difficult, scientists and engineers have learned how to operate a robotic spacecraft on the surface of Mars from Earth. Unfortunately, due to the vast distance between the Earth and Mars spacecraft cannot be operated in real-time like a remote controlled car on Earth. It takes commands approximately 10 to 15 minutes to travel from Earth to Mars and another 10 to 15 minutes to get responses from the spacecraft back to Earth. Mission planners must write a sequence of specific commands on Earth to send to the spacecraft on Mars. Mission planners must be very careful and very specific about what they want the spacecraft to do if they are to be successful. Future plans for sending humans to

Mars include sending robots first to construct the habitats where humans will live and work. In this activity, students will experience what it is like to give specific commands to construct something with their partners.

Understandings

1. Robots gather different information (data) depending on their design and use.

Materials

1. Two (2) sets per pair of students of Lego’s, pattern blocks, or anything that can be used to build. *Both sets for a group should have identical building materials.*
2. Divider to hide work from partner.

Time

Ten minutes for explanations

Ten minutes for each student in the teams

Five minutes for discussion

Directions

1. Pair students together and hand out building materials.
2. Discuss with the students how NASA is planning to use robots to construct the places where humans will live and work when they eventually arrive on Mars. *Discuss that humans will have to command the robots on Mars from Earth.*
3. Tell students that one student is the Engineer on Earth designing something using the materials given to them, which will be built on Mars by their partner robot. The other student will act as the Robot on Mars to reconstruct what the first student built, using only

commands given to them from the Engineer.

4. The divider should be placed between students to hide the constructed object from view.



5. Once the Engineer has built the object, the Robot must build the same object without looking at the original, using only commands from the Engineer. The Engineer, however, cannot assist the Robot by any means other than confirming the correct placement of a piece. The Engineer may not touch the Robots object or tell them something is wrong.
6. Once the object is finished being rebuilt, have the students switch jobs.
7. Discuss the difficulties of building something using only the commands of the Engineer on Earth.