

# Building A Robot Arm

Grades satisfied are 7-9

Time to completion is 30 minutes to design/construct and 30 minutes to maneuver the arm

## Background

In the case of many planetary surface robots, it is very desirable to have a robotic arm on board for manipulation and collection of objects on the surface. In order for those arms to function effectively they must be able to easily follow instructions. Those instructions may involve very detailed tasks, but in the realm of long distance communication, it is highly desirable to deliver those instructions as quickly and efficiently as possible. In this activity, you will construct your own robotic arm with the help of your classmates and then write out a set of procedures to be completed. Students should bring in common household items to use in building a robotic arm such as salad tongs, chopsticks, tweezers, etc. Invite students to use their ingenuity in creating an arm of their own.

## Objectives

The students will design, construct and operate a robotic arm

## Standards

Science:  
Abilities of technological design  
Forces and motions  
Order and organization  
Evidence, models, and explanation  
Form and function

## Materials

Access to www - <http://www.history.rochester.edu/canal/bib/abbott/>

## **Procedure**

1. Organize students into pairs. Without telling the students ahead of time what the task will be, explain that the class teams will be simulating a robot arm that can perform a multitude of tasks. The arm that the students design and build must be flexible in its abilities

Constraints:

- The arm will be operated like the “Robot built by Humans” the arm manipulator is “blind” and cannot view the task itself and must take directions from a “brain” or human operator.

- The arm must be made from common household items

- Only one word commands will be allowed, such as “Forward...Backwards...Up...Down...Open...Close.” The maximum length of each signal is 12 one-word commands.

2. Give the students time to design their arm and select 12 commands.

Allow them time to practice and refine their method without blindfolds.

3. After the commands have been selected, one partner must be blindfolded, only then should the marshmallows and cup be handed out and the task of putting the marshmallow into the cup through the use of the commands be explained to the other partner.

4. The marshmallow should be placed somewhere in the room for the “robot” partner to locate by following the commands of the “brain.” After the marshmallow has been retrieved, the commands should be used to place it inside the cup.

## **Assessment**

Student groups will be evaluated on their successful construction of the robotic arm and the completion of the task posed to the group.

## **Extensions**

1. Have students try a different task such as putting a shoelace through an eye screw with blindfolds on

2. Set up a timed competition between teams on the tasks specified in this lesson

3. Try switching partners’ roles in the activity

4. Repeat the competition after students have had the opportunity to research and design better robot arms. You may want to allow dual-arm interaction.