

**SUMMARY:**

Learners will explore logical thinking and programming.

**GRADE LEVEL:**

This activity has been used successfully with 1<sup>st</sup> to 3<sup>rd</sup> graders.

**TIME:**

This activity takes approximately 30 minutes with 1<sup>st</sup> to 3<sup>rd</sup> graders. Depending on learners' prior experience this time may need to be extended or shortened.

**SUBJECTS:**

Programming, Logical thinking, Language Arts.

**LEARNER BACKGROUND:**

None needed

**LEARNING OBJECTIVES:**

Completing this activity will allow learners to:

- understand that a program is a series of instructions.
- understand logical steps involved in performing an activity.

**Discover Question:**

How can you program a robot to make a sandwich?

**Background:**

This activity encourages learners to explore introductory programming concepts.

Learners will be challenged to think logically step by step to describe (in writing) to a "robot" how to make a frosting sandwich to eat. Simple daily activities become complex when you have to explain them to some one else. Learners will discover that directions need to be specific and word phrases can be interpreted many different ways.

The robot can be any volunteer. This activity is a really fun way to involve parents, principals and other educators. The most important caveat for the robots is that they must be extremely literal (lawyers make good robots). There is a separate [Robot Instruction Sheet](#) to give to your robot volunteer(s).

The educator needs to facilitate the sharing of observations and ideas. Try to avoid answering questions directly. Instead, ask questions like what have you tried? What do you notice? What else could you try? These types of questions encourage further exploration.

**Materials:**

- Frosting Sandwich Supplies:
  - Graham crackers or bread (in box or bag)
  - Frosting (vanilla and chocolate) and/or Peanut Butter
  - Knives (add forks and spoons to increase robot 'mistakes')
- Place all supplies in an area that is "hands-off" to non-robots. I use a 2'x3' piece of paper with a construction ribbon type drawing around its edge.
- Each group of learners should have the following community supplies:
  - Index cards and pens/pencils for learners to write programs.

**Resources and Handouts:**

- [Robot Instruction Sheet](#) (give this to the "robot" ahead of time)

**Procedure:**

- 1 You can introduce the activity any way that is appropriate for your class. I have told learners that they need to help NASA repair the Mars Rover that needs to be reprogrammed. Thus NASA has asked them to figure out how programs work.
- 2 "We have some special robots that can make graham cracker and frosting sandwiches - with the proper programming. The robots can read commands on cards so write down what you want the robots to do. The only rule is that you are not allowed to touch any of the stuff in the non-robot area."
- 3 Encourage learners to "try out" their programs. Remember that robots will only respond to a written command so learners can not just shout "stop" to get their robot to abort a badly worded command. After a while you may want to suggest drawing a "stop" button on the edge of the robot zone to facilitate in debugging their programs.
- 4 After robots misinterpret programs encourage learners to fix programs by asking open-ended questions "What went wrong?" "Why do you think the robot got confused?" "What could you do differently?"
- 5 Discuss the differences and similarities in the programs. Introduce the notion that programs tell the machine what to do and that they must be specific.
- 6 Discuss results from other extensions you may have explored.

**MODIFICATIONS/****ADAPTATIONS:**

Older learners typically find this just as challenging as younger students.

Younger learners (pre-readers) can draw pictures of each step that the robot should take.

**HELPFUL HINT:**

Have the robot read the instructions as they are performing each step to help learners 'debug' programs.

**EXTENSIONS:**

- ✓ Eat the snack!
- ✓ Try to write a program for a friend to write a word - without telling what letters you want them to write.

## Safety Considerations:

- Be aware of any dietary restrictions that people may have. Modify the ingredients to suit.

## Assessment Ideas:

- Can the learner explain the steps required to make a sandwich?
- Can the learner explain the steps required to tie a shoe?

## Internet Resource:

This is part of a NatureShift unit introducing programming that can culminate in controlling the Mars Rover telerobot.

### CREDITS:

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