

PUPPY PROGRAMMING

Learn to program without a computer!

Curriculum topics:

- Programming
- Spatial Thinking
- Problem Solving
- Patterns
- Cause & Effect

Subject:

Physical Science,
Mathematics,
Technology

Grade range: K – 8

Who we are:

Resource Area for Teaching (RAFT) helps educators transform the learning experience by inspiring joy through hands-on learning.



START

END



Lead the puppy to the tennis ball by giving exact directions, programming the puppy's path. This fun and easy activity reinforces programming techniques such as planning, sequencing, testing, debugging, and creating procedures and loops.



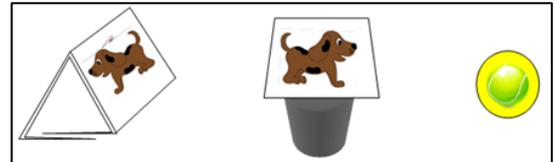
Materials required per model

- Program board with holes (x1)
- Corks or equivalent (x13)
- Basic direction card set, white (x1)
- Advanced direction card set, yellow (x1)
- Puppy pattern (x1)
- Tennis ball pattern (x2)
- Adhesive circles or equivalent (x2)
- Game token, flat (x2)

Set-Up

1 Decide whether the students will use basic or advanced cards (see descriptions below). Note the puppy & ball patterns.

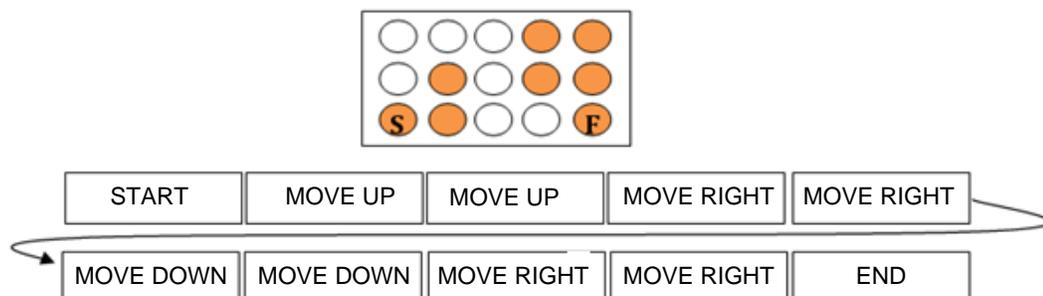
2 Sort identical cards, face-up, into piles by action type (such as move up, move down, rotate clockwise, move forward).



3 To create the puppy game piece, cut puppy and balls apart, then fold along the dotted lines. Peel the paper off both sides of a double-sided adhesive circle and attach the ends together to form a triangular prism (see above). Use another double-sided adhesive circle to attach the puppy piece to a cork. Create the ball token by attaching a ball pattern to one side of the flat game token.

To do and notice

- 1** Choose the orientation of the programming board, three up and five across or vice versa.
- 2** Place the puppy game piece at the desired starting point and the ball token at a finish point. Note: The direction the puppy game piece faces only matters if using the advanced card set.
- 3** Create an open maze by using the corks as barriers to fill some of the spots and create turns in the path. The path should not require diagonal movement.
- 4** Arrange the cards to direct the puppy from start to finish without running into any spots that are blocked. The program completes when the puppy lands on top of the ball. Place the cards in order with the “start” card at the beginning and the “end” card at the end. Stack the ordered cards, which represent a program (see below).
- 5** Follow the directions on your stacked set of cards and see if the puppy can land on the tennis ball token. Exchange boards and program cards with another student or team. Let them run the program by following the cards and moving the puppy around the board. If the program does not work, the students must work together to debug (correct) the program.



Content Standards:

NGSS

Optimizing Design Solutions:
[K-2-ETS1-3](#)

Compare and Test Multiple Solutions:
[3-5-ETS1-2](#)
[MS-ETS1-2](#)

The science behind the activity

A **program** is a set of exact instructions that a programmer writes to tell a computer how to do a task. A **procedure** is a list of step-by-step instructions within the program that the computer executes. A **loop** is a set of instructions that are repeated.

Using the basic cards reinforces the importance of order. The advanced cards add the element of direction, along with a repeat function. The repeat card introduces the student to **loops**, which repeat a set of instructions a given number of times or until a certain condition is reached.

Writing a good program requires planning and foresight to anticipate how the computer will react to a command or set of instructions. Occasionally, though the program follows the instructions, it does not get the desired result. It is up to the programmer to **debug** the program by going over the instructions and correcting any errors.

Learn more

- Have another student or team create a program for the same path and compare solutions.
- Come up with as many variations as possible to get from start to finish.
- Create a path with two possible routes. Find the one that requires a program with the least number of steps.
- Change the orientation of the board and rewrite the program to work.
- Choose and arrange cards to make a program without moving the game piece.
- To check the program, have one student read out the directions verbally, while the other navigates the game piece through the game board.
- Place multiple game boards together to create a more challenging board.

Visit <https://raft.net> to view the following related activities!

Caesar Cipher Disc
Puzzling Directions
Binary Dots
Binary Birthday Bracelets

Resources

- Learn to code - <http://code.org/learn>
- Community for coding and support - <https://www.madewithcode.com/>