Reaction Time STEM Experiment

Overview:

This lesson uses the micro:bit to measure the reaction time of a student by completing a circuit on a board. The student will be measuring his/her reaction time in an undistracted environment and a distracted environment.

Students will be able to:

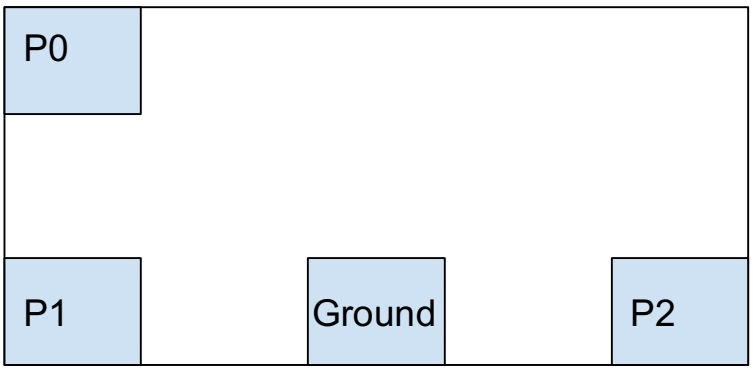
- Design and carry out an experiment to test their reaction times using the micro:bit.
- Utilize simple block code to produce a device that will measure and read out reaction times.
- Construct a data table and graph to observe a trend
- Make a conclusion based on the data
- Construct a model to describe how animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. 4-LS1-2

Materials needed:

- 1 micro:bit device with USB cable
- 1 battery pack
- 1 3’ x 2’ piece of cardboard
- 4 7”x7” pieces of aluminum foil
- 4 wires with croc clips

Recommended Procedure:

1. Download the code here onto the micro:bit and connect the battery pack to the micro:bit.
2. Fold the foil squares and place them around the cardboard according to the schematic below.



3. Connect each piece of foil to the appropriate pin on the micro:bit. Note: For the experiment we will not be utilizing the P2 pin.
4. Test the apparatus by putting one hand on the ground pin and one hand on the P0 pin. This will complete the circuit and start the timer on the micro:bit after a 3 second count down.
5. Once the timer starts, wait for the LED screen to light up and then press the Ground foil with one and the P1 with the other. This will connect the circuit and shut off the timer.
6. The micro:bit will then read off the time in milliseconds from when the timer starts and the circuit is completed.
7. The student should then attempt this exercise in the presence of distractions. Example distractions include:
    - Auditory distractions (i.e. having to listen to a story told by a partner)
    - Language processing distractions (i.e. telling a partner about his/her daily routine)
    - numeral processing (i.e. having to solve simple math problems)
    - physical activity (such as jumping up and down)
8. Have the students place the data into a table similar to the one below. Remember that the students should do multiple trials for accuracy.

Type of Distraction	Response time (s)
None	
Listening to a Story	
Telling a story	
Solving oral math problems	
Physical Activity	

9. After the table is completed, have the students make a bar graph on a piece of graph paper and then compare with the rest of the class.

Recommended Discussion Questions

- Is there a change in response time with and without the presence of distractions?
- Which type of distractions generated the biggest difference in response time?
- What explanation can you develop that would explain the observed trend?
- Go to this website with a bunch of different analogies for the brain. Based on your data, which do you think are the best analogies for the brain?

Standard Addressed

Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. 4-LS1-2

Crosscutting Concept

A system can be described in terms of their components and interactions.

Disciplinary Core Idea

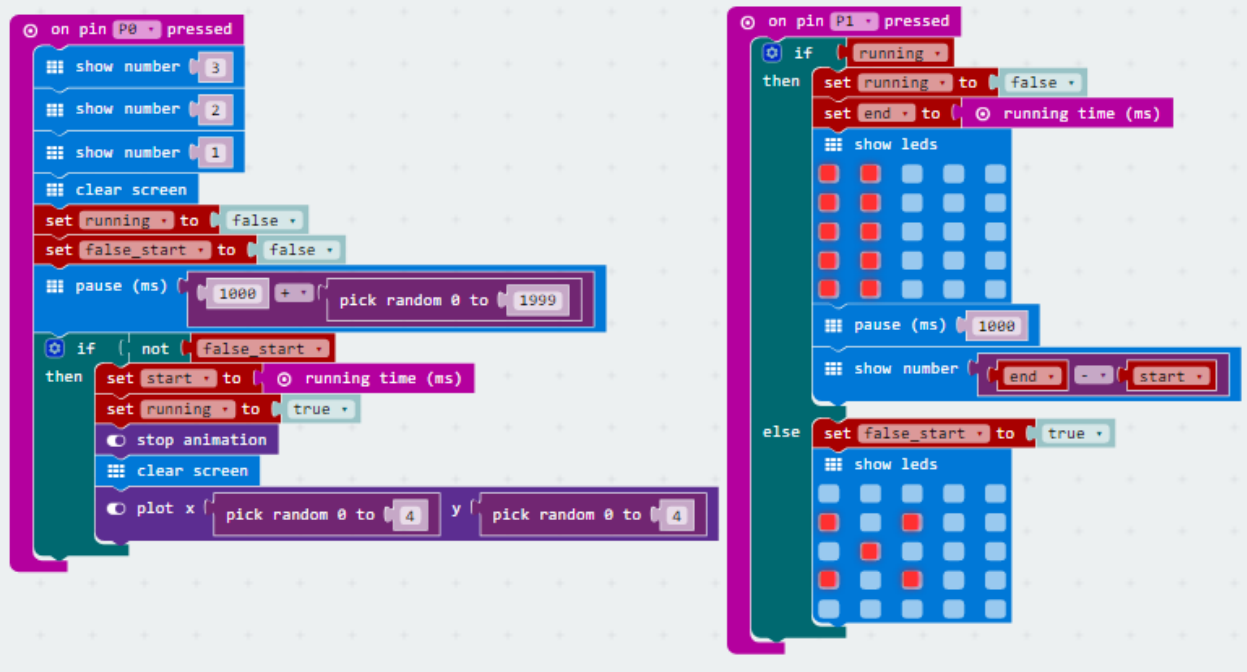
- Different sense receptors are specialized for particular kinds of information, which maybe then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.

Science and Engineering Practices

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
- Support an argument with evidence, data or a model.

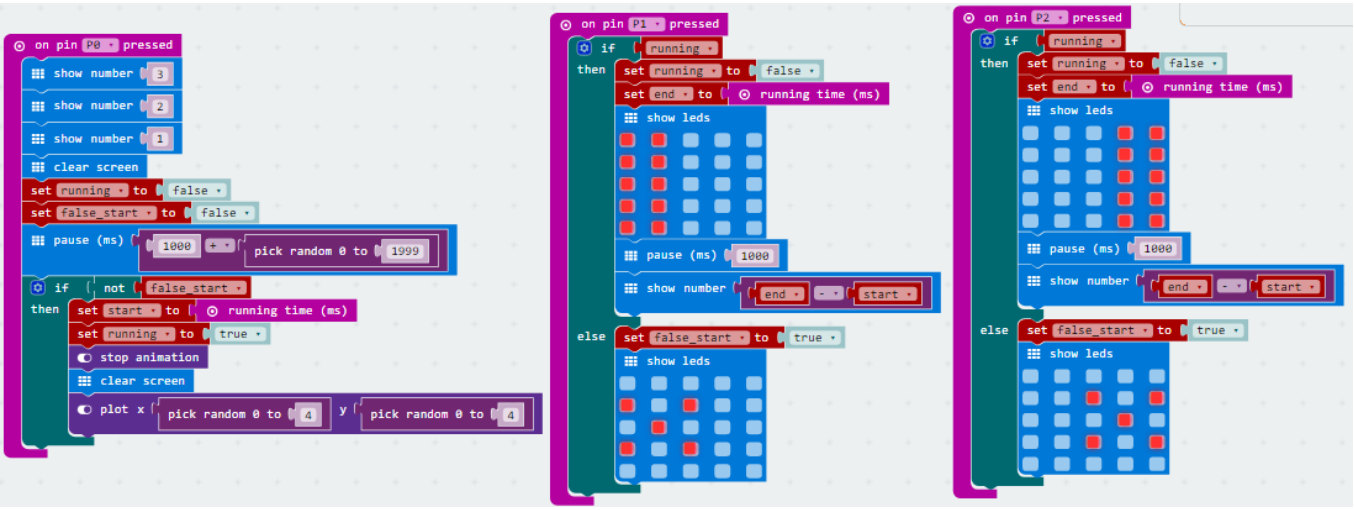
Experiment: Make Code

See: https://makecode.microbit.org/projects and scroll to STEM



Extension

After the students have finished their experiments. Have them play the game with a friend (using the P2 pin) and have competitions to see who is the quickest on the draw!



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