

Lesson #11: Finch Robot Introduction



Overview:

During this lesson students will be introduced to the Finch robots for the first time. They will learn the basic commands to get the robot to move forward, backward, turn as well using the robot led light. On the second day of the lesson, they will learn the code that is needed to use the light sensor.



Student Agency:

The majority of the lesson allows students to explore using the finch robots and functions. They will be problem-solving and collaborating throughout both class periods.



Pathway:

- Coding/Computational Thinking



Duration: Two classes (40 minute class)



Essential Question: What is computer programming and why is it important?
What are the benefits of coding?



Objectives:

- Students will be able to successfully learn the basic commands for the Finch robot.
- Students will be able to explore and problem-solve basic coding concepts used with the Finch robot.

 <u>Competencies & Practices</u>	 <u>Student Artifacts/Evidence</u>
Collaboration	Group work
Algorithms/Procedures	Understanding the sequence in coding



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Test and Debug	Finch robot exploration
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Teacher Preparation:

- Be sure to have the Finch library folder (FinchPython120) loaded onto every student computer.
- [#033- Finch Cheat sheet](#) with basic robot commands
- Share, print or project the [#034- Introduction to Robot Challenges](#)



Materials for Students:

- Computer with Pyzo
- Finch robots



Students Prior Knowledge:

No prior knowledge necessary.



Concepts:

- Library- code that someone else created and we're just using it to adapt and make it our own.



Habits of Mind:

- Persisting
- Listening with Understanding and Empathy
- Questioning and Posing Problems
- Responding with Wonderment and Awe



Lesson Sequence:

Day 1:

1. Anticipatory Set:



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- a. At the beginning of class, students should complete a warm up activity that focuses on if/elif/else statements. In this warm up activity, write pseudocode on the board and students will have to decipher your pseudocode into python code.

Example:

animal= 9

if the variable is greater than 32 it will print, zebra- elif the variable is less than or equal to 8, it will print lion- elif the variable is not equal to 9 it will print elephant- else it will print monkey

2. Engaging Activities:

- a. Have students create a new Pyzo file named testFinch.py. Students should save the file into the FinchPython120 folder on their desktop.
 **Teacher Tip:** Saving the file into the FinchPython120 folder on the desktop is a very important step. The finch will not work unless the file is placed in that folder.
- b. Pass out Finch robots. Each group should get one robot.
- c. Have students plug the finch robot into a USB drive on the computer. The beak of the Finch should light up then turn off.

Remarks

- d. During our next challenge to get off Mars, we'll be using the Finch robots. Before you begin the challenge, you will need to understand and create basic robot commands. Today you'll be learning the basic commands and also problem-solving and exploring with the finch robot.
- e. Today we'll be learning how to move the robot and turn on the led light.
- f. Before we get the robot to do anything, we need to import the finch library. The finch library is actually located on the desktop of your computer and in order for the finch to see the code, we had to save the file into the same folder.
- g. In line 1, type in **from finch import Finch** Keep in mind that, python is case sensitive!
- h. In line 2, type in **from time import sleep**
- i. In line 3, type in **finch= Finch()**
- j. In lines 1 and 2 we're importing from the finch libraries.



Questions to Ask Students:



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- The finch library is similar to the turtle library. What is a library? *A library holds code that someone else created and we're just using it to adapt it and make it our own.*
- k. Line 3 is initializing the finch. `finch.wheels`. If we type in `finch.wheels(1.0, 1.0)`. We're telling the wheels to move.



Questions to Ask Students:

- Why do you think there are two values in the parameters?
Each wheel has a value.
- i. 1.0 is the fastest each wheel can move. If we change the value to 0.5 and 0.5, each wheel of the robot will move at half speed.
- l. The next line of code is `sleep(4.0)`.



Questions to Ask Students:

- What do you think sleep does? *Sleep makes the robot move forward for a certain amount of time.*
- m. Have students run the code, (CTRL+s and CTRL+shift+e).



Teacher Tip: When students run their code, although they used the `sleep(4.0)` command and told their robot to run for 4 seconds, the robot will not stop!

- n. Have students stop their robot by closing their shell, (red x in the shell).



Questions to Ask Students:

- Although we told our robot to move forward for 4 seconds, why don't you think it stopped? *Because we need to tell the wheels to stop by using the code, `finch.wheels(0.0,0.0)`*
- o. Have students add `finch.wheels(0.0, 0.0)` to the end of their code.

Example code:

```
from finch import Finch
from time import sleep
finch=Finch( )
finch.wheels(1.0,1.0)
sleep(4.0)
finch.wheels(0.0, 0.0)
```

- p. Instruct students to add to their code. This time they need to figure out how to make the robot turn.



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Teacher Tip: During this time students will try to add just one line of code such as `finch.wheels(0.8, 0.2)`. The robot will keep turning in circles. At this time, students will understand that for turns they must also figure out how to use the sleep command.

Example code:

```
from finch import Finch
from time import sleep
finch=Finch( )
finch.wheels(1.0,1.0)
sleep(4.0)
finch.wheels(0.0, 0.0)
finch.wheels(0.8, 0.2)
sleep(2.0)
finch.wheels(0.0, 0.0)
```

- q. Once students have successfully completed the turning challenge instruct them to add comments.

Example code:

```
from finch import Finch
from time import sleep
finch=Finch( )
#robot will move forward at full speed for 4 seconds then
stop
finch.wheels(1.0,1.0)
sleep(4.0)
finch.wheels(0.0, 0.0)
#robot will turn for 2 seconds then stop
finch.wheels(0.8, 0.2)
sleep(2.0)
finch.wheels(0.0, 0.0)
```

- r. The last command you will need for the upcoming robot challenges is turning on the led light. To do this, you will need to use the function, `robot.led(int, int, int)`. For example `finch.led(125, 140, 23)`.



Questions to Ask Students:



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- Why do you think there are 3 values? When you think of units of measurement in terms of light in computers, what do you think of? *RGB values*
- s. Light measurement in electronics is calculated by mixing red, green and blue together. When you mix colors in art class, the color typically gets darker but when you mix lights, the exact opposite happens! LED light colors actually get lighter! The highest each value can go is 255. For example, if we use `finch.led(255, 255, 255)` that would turn the led light white. If we would use `finch.led(0,0,0)` that's black.



Questions to Ask Students:

- What color would the led light be if I used the command, `finch.led(255, 0, 0)`? Why? *Red because 255 is the highest the value can go, the green and blue lights are completely off.*
- What color would the led light be if I used the command, `finch.led(0, 0, 255)`? Why? *Blue because 255 is the highest the value can go. The red and green lights are completely off since they are set to 0.*
- t. For the remainder of class, allow students to explore with the finch robots. Project #034- Introduction to Robot Challenges for students to complete.

3. Wrap Up:

- a. Review assessment questions with students.

Day 2-3:

1. Anticipatory Set:

- a. Have students create a new pyzo file named, `robotExample.py`. The file must be saved in the `FinchRobot120` folder on the desktop.
- b. Instruct students to input the following code into the Pyzo file.

```
from finch import Finch
from time import sleep
finch= Finch( )
```

- c. Allow students 10-15 minutes to just play with the finch robots. During this time, encourage them to move the finch forward, backward, turn and stop. They should also try to turn the LED on and off and test the different colors.

2. Engaging Activities:



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- a. Have students create another pyzo file named, robotLightSensor.py. The file must be saved in the FinchRobot120 folder on the desktop.
- b. Instruct students to input the following code into the Pyzo file.

```
from finch import Finch
from time import sleep
finch=Finch( )
```

Remarks

- c. Next class you and your partner will be working on a challenge that will use the light sensor. There are certain lines of code that you will need to test the light sensor.
- d. To initiate the light sensor, type the following code into the Pyzo file.

```
lightValue= finch.light( )
print(lightValue)
```

- e. The first line is basically using the function to test the light. The function is finch.light().



Questions to Ask Students:

- What is lightValue=? *It's a variable.*
 - What is the next line doing? *We're just printing the variable so we can see the output.*
- f. By printing the variable we're going to see a number. If we put the finch out in the light and run the code, we're going to see a number in our shell.
- g. Have students run the code with the lights on and the lights off. Do this multiple times so they can see the difference in light values. The higher the value, the brighter it is.
- h. Discuss the different values.



Questions to Ask Students:

- What would happen if we put the finch under something that is completely black? *The light value will be 0.0 because black does not reflect light.*
- i. Allow students time to test the light sensor.

Optional:

Have students type in the following code.

```
from finch import Finch
from time import sleep
finch=Finch( )
```



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```
while True:
    lightValue= finch.light( )
    print(lightValue)
```

A while True loop will go on forever and is an infinite loop. Every iteration, it will test the light value then print it. Turn the lights on and off as the loop runs. Students will see the light value constantly changing in their shell.



Teacher Tip: Since students did not learn loops yet, this can be a confusing concept. While working through the if/else robot challenge, sometimes students will try to use a while True loop. Using a while True loop in the robot challenge causes problems because the loop will constantly run and will not run any other lines of code.

3. Wrap Up:

- a. Complete the lesson by asking the assessment questions to reinforce the functions.

 Assessment Questions	Yes	No
Why are there two values used in the parameters for the functions finch.wheels?		
What is the fastest value the wheels can move?		
What does the sleep command do?		
How do we get the robot wheels to stop moving?		
Why are there 3 values in the finch.led parameters?		
What does the function finch.light() do?		



Activities for Relearning:

Allow students time to play with the robots without instruction at the end. During this time, they can explore the functions in addition to understanding syntax errors.



Activities for Enrichment:



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Students can review the [documentation](#) and test various functions the finch can do.



Resources for Teachers:

- <https://www.birdbraintechnologies.com/finch/curriculum/python/>



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