



Python Coding Lesson

Lesson Title:	Plastic Footprint Calculator
Grade Level:	High School
Subject:	Environmental Science
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Engagement:

- Teacher will show students the TED-Ed talk on the [Life of a Plastic Bottle](#) and lead a discussion on the short video.
- Possible questions:
 - What is a plastic (in your own words)?
 - What are some of the dangers of using plastics with regards to our environment?
 - What is the Great Pacific Garbage Patch?
 - How did the journey of bottle 1 and 2 compare with bottle 3?
 - Have you ever thought about your own plastic consumption? What kinds of things do you use daily that have plastic in them?



Source: <https://www.pinterest.com/pin/517351075936046608/?nic=1a>



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- Potential student misconceptions:
 - Students may not know how plastics are created
 - Students may not know how plastics affect living things and environment
 - Students may not think about their plastic footprint and/or may not see their impact as being significant in the grand scheme of things

Exploration:

- Students will be asked to log into their Google account and open the text version of python program, Plastic Footprint Calculator, in a Google document.
- Teacher will ask the students to complete a think, pair, share activity where they will have to think about what the computer code is doing with a partner and then eventually share their results with a class. Each group will be given a piece of giant poster paper to display their findings.
- The students will then be instructed to use the Repl.it website to run the code and determine their plastic footprint.
- Potential questions:
 - What do the different names mean?
 - What do we call terms in math that can vary or change?
 - What does the += do in the program?
 - What is the purpose of the program?
 - Does the program have any errors? How could we find out?
- Potential student misconceptions:
 - Students may not be able to fully explain what each line of the Python code does but may be able to use context clues based on the variable names, etc.
 - Students may need the teacher to scaffold discussion so they can better understand the computer code.

Explanation:

- Students will present their findings in their think, pair, share activity and their exploration of the Python program on Repl.it.
- The teacher will also have the students think about their plastic consumption.
- Potential questions:
 - What do the different names mean?
 - What do we call terms in math that can vary or change?



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- What does the += do in the program?
- What is the purpose of the program?
- Does the program have any errors? How could we find out?
- How much plastic do you consume daily? Weekly? Monthly? Yearly?
- If everyone consumes this much plastic, do you think this is a good thing for the environment? Why or why not?
- Potential student misconceptions:
 - Students may not be able to fully explain what each line of the Python code does but may be able to use context clues based on the variable names, etc.
 - Students may need the teacher to scaffold discussion so they can better understand the computer code.

Elaboration:

- Students will watch the introductory video for the National Geographic Geo Challenge (student competition where they propose a solution to the issue of plastics in the ocean) and think about ways they can eliminate plastics from the ocean.
- The students will also think about how writing a computer program might help in their challenge.
- Potential questions:
 - What is the National Geographic Geo Challenge?
 - What ideas do you have to solve the issue of water pollution in the oceans? Can you list the pros and cons of your solution?
 - How could writing a computer program help us figure out the solution to this problem?
- Potential student misconceptions:
 - Students may not be sure how to address the issue of problem of plastics in the ocean so they may need to be shown examples of what people have done in the past to solve the problem.
 - Students may need be shown pictures of the masses of plastic stuck in the oceans for them to realize this is a big problem (that has consequences for all living things!)
 - Teacher may need to share some apps people are/have created in relation to pollutants in the water.



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- Teacher may need help students think about ways to conserve and recycle plastic if students have not considered it.

Evaluation:

- Students will take an exit ticket with the following questions:
 - How does plastic waste affect living things?
 - How much plastic do you consume daily? Did this surprise you? Why or why not?
 - What can you do to limit that amount?
 - What ideas do you have for your app to save the ocean?
 - Write some sample code based on what you learned today that will input a number, store it, and display it on the screen.

Next Generation Science Standards:

- MS-ESS3A -3:
Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- MS-ETS1-1:
Define the criteria and constraints of a design problem with enough precision to ensure a successful solution, considering relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

Code:

```
#This program calculates your plastic footprint  
  
print ("The purpose of this program is to determine what your plastic footprint is each day,  
week, month, and year in pounds.")  
  
print("If you do not consume that item in the week, please enter 0 for that category.")  
  
cup=int(input("How many plastic cups do you use in a week?"+" "))  
  
straws=int(input("How many plastic straws do you use in a week?"+" "))  
  
cut=int(input("How many pieces of disposable cutlery (plastic forks/knive,etc.) do you use in a  
week?"+" "))  
  
plates=int(input("How many plastic plates do you use a week?"+" "))
```



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```
pbot=int(input("How many PET plastic bottles do you use and throw out in a week?"+" "))  
pbags=int(input("How many plastic bags do you use in a week?"+" "))  
fwrap=int(input("How many food wrappers do you throw out in a week?"+" "))  
yogurt=int(input("How many yogurt containers do you use in a week?"+" "))  
swabs=int(input("How many cotton swabs do you use in a week?"+" "))  
detergent=float(input("How many detergent bottles do you use a week?"+" "))  
shampoo=float(input("How many shampoo/shower gel/handwash bottles do you use in a week?"+" "))
```

*#Calculations based off of Plastic Footprint calculator at
<https://www.omnicalculator.com/other/plastic-footprint>*

```
week= float(pbot*0.0794)  
week+= float(pbags*0.0175)  
week+= float(fwrap*0.0328)  
week+= float(yogurt*0.0328)  
week+= float(swabs*0.00219)  
week+= float(detergent*0.265)  
week+= float(shampoo*0.175)  
week+= float(cup*0.0438)  
week+= float(straws*0.001)  
week+= float(cut*0.00876)  
week+= float(plates*0.0528)  
day= float(week/7)  
month= float(week*4)  
year= float(month*12)
```



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```
print("You consume "+"%.2f" % (day)+ " pounds of plastic per day.")  
print("You consume "+"%.2f" % (week)+ " pounds of plastic per week.")  
print("You consume "+"%.2f" % (month)+ " pounds of plastic per month.")  
print("You consume "+"%.2f" % (year)+ " pounds of plastic per year.")  
input("Press enter to end the program.")
```