Activity 3.2.2

Shocking Data Trends

GOALS

- Identify the inputs that are needed for a program to work.
- Evaluate how different inputs affect the output of a program.

MATERIALS

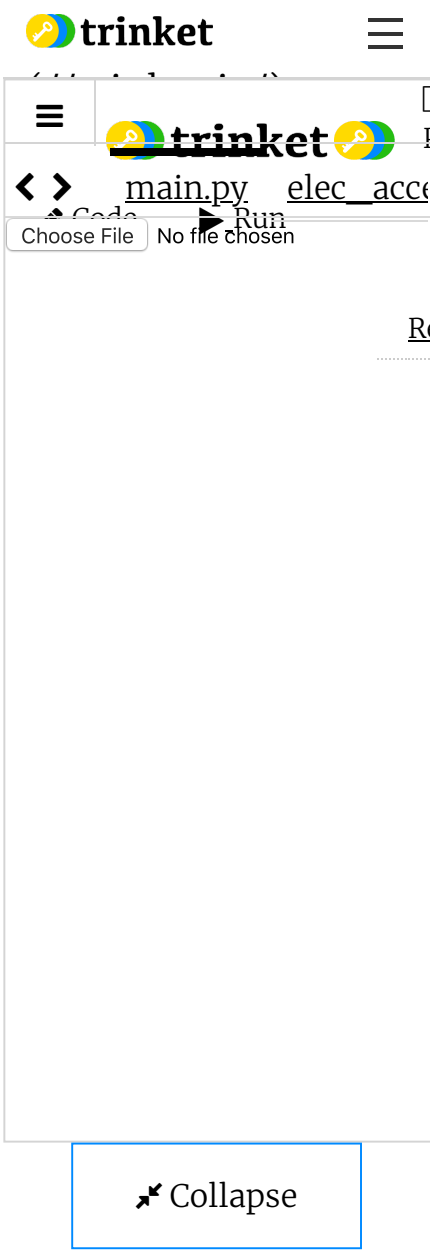
- Spreadsheet software (Google Sheets)

Access to Artificial Light

Can you imagine what your school would be like if candles were the only source of light? The controlled form of electricity you are accustomed to has been around for only a century. Before light bulbs, artificial light was in the form of candles and gas lamps. Now there are LED light bulbs that can be programmed to change colors. Even though electricity in the United States is available everywhere, the same cannot be said for other countries. In lesson 2, you learned about computing innovations. Electricity is not a computing innovation, but several computing innovations need electricity to work. Therefore, the lack of access to power can affect people's access to these devices.

In this activity, you will use data that contains electric power grid information from countries around the world.

1. Download and extract the following program and data file into VSC and rename *main.py* to *a322_electricity_trends_[studentinitials].py.*



2 Locate the `elec_access_data.csv` file and open it in spreadsheet software to view its contents.

3 Observe the data and identify the following information.

- What year range does this data contain?
- Approximately how many countries are represented in this data set?

Need Help?

- Is every country in the world represented in this data set?

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Reflection Question: Why do you think some countries might not be represented in this data set?

Organizing Data

Now that you have seen the data, you are going to construct a graph comparing the various countries' access to electricity.

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Describe an algorithm you would follow to compare two different countries without programming.

To generate meaningful graphical representations of the data using *Python*®, you will begin by extracting the data from the CSV file.

4 Review the code and comments in the code. What do you think the following code does?

```
unique_countries = df['Entity'].unique()
```

Check your response

The *electricy_trends* program uses a new pandas script you haven't seen before. Observe the `if` statement inside the `for` loop. From the `for` loop and `if` statement you know `c` is a placeholder for every unique country in the data. If `c` is also in `my_countries`, then you will initialize the variables `years` and `sum_elec`.

Observe the first line of code within the `if`-statement.

```
years = df[df['Entity'] == c]['Year']
```

This line of code is setting `years` equal to a list of years for a specific country.

How Does This Work? The steps below break down the code.

First, `df[df['Entity'] == c]` creates a `DataFrame` of all the rows where the country is equal to `c`.

Then, adding `['year']` to the end of the `DataFrame` creates an array of all the values under the year column of that `DataFrame`. So, `df[df['Entity'] == c]['Year']` creates an array of years for country c.

5 Break down and describe what is happening with the following code.

```
sum_elec = df[df['Entity']==c]['Access']
```

6 Run the program. You should see the following graph.

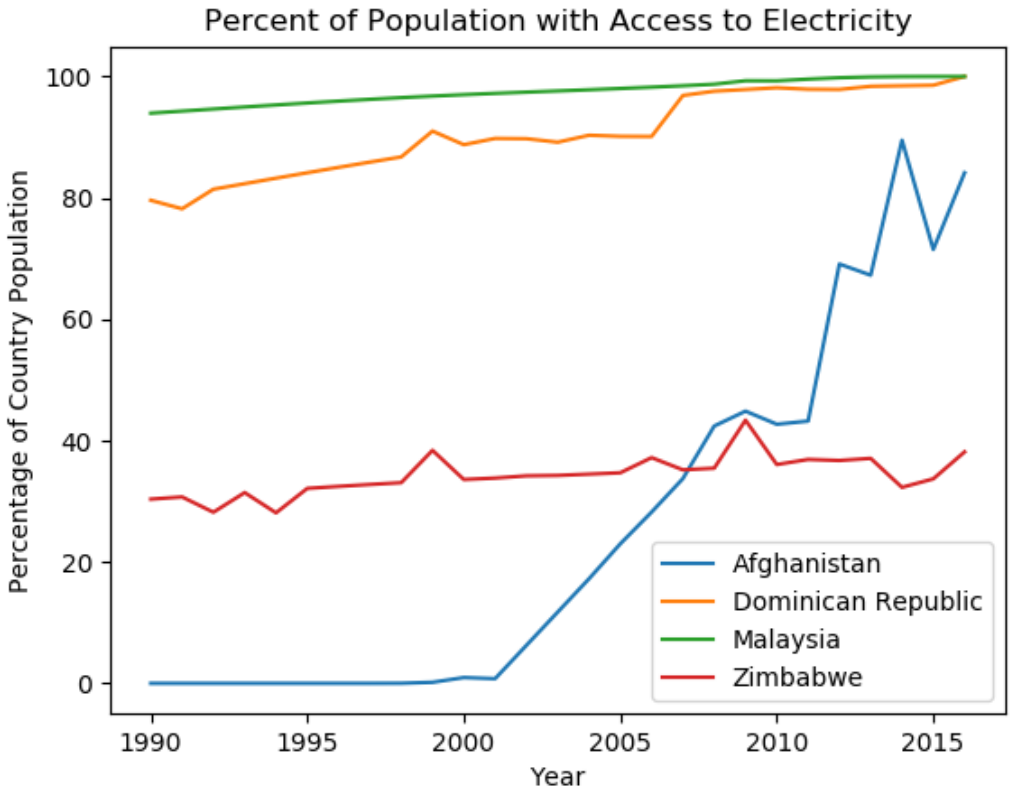

Figure 1. Graph Showing Population with Access to Electricity

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Identify the parts of the code that create each of the following:

a. The data set that will be used to generate the graph
b. The countries that will be plotted
c. The labels for the x-axis, y-axis, and the title

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Making Data More Appealing

One of the features of the pandas `plot` method is changing the look of line graphs by changing the `marker` and `linestyle` parameters.

`marker` parameter options:

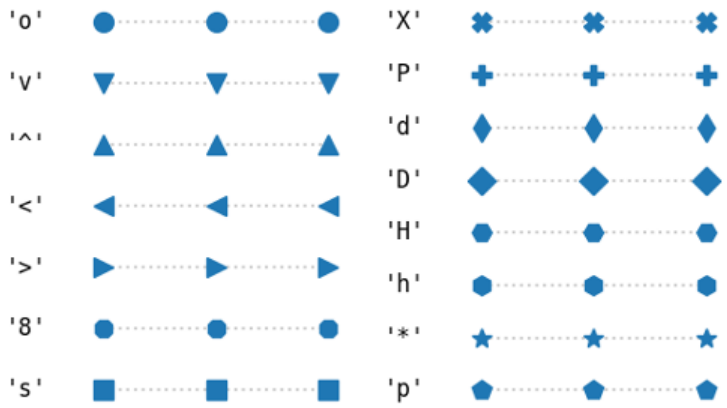

Figure 2. Marker Options for Line Plots in matplotlib

`linestyle` parameter

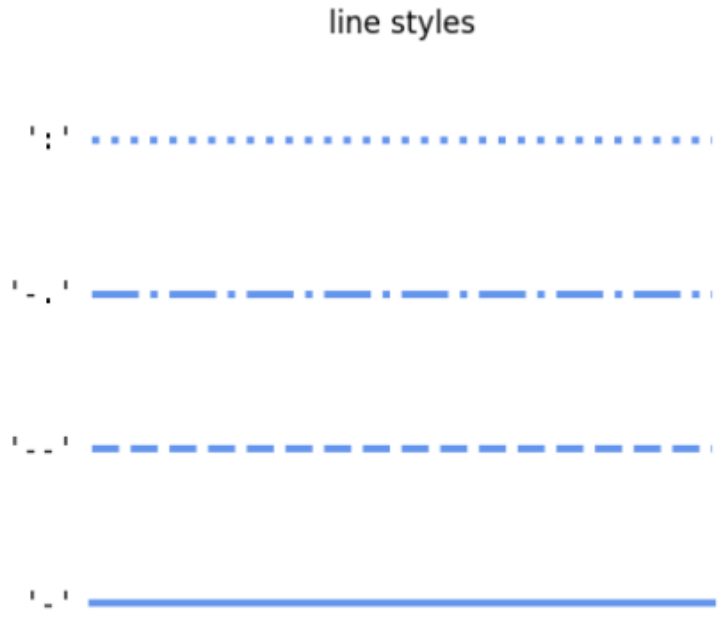

Figure 3. Line Style Options for Line Plots in matplotlib

7 Improve your program.

a. Modify the code to include a `marker` and a `linestyle` in the `plot` method.

b. How do the `marker` and `linestyle` enhance the output of your code?

Reflection Question: Can you think of a time you had to use a graph that was difficult to read? How could that graph be better?

Trends in Each Continent

Now that you have the ability to generate good-looking line graphs, you can observe trends in different continents.

8 Modify the code to compare access to electricity from different countries. Use different looks for each continent and use screenshots to keep track of each of the graphs you generate.

a. Compare six North and South American countries.

b. Compare six European countries.

c. Compare six Asian countries

d. Compare six African countries

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9 Observe the four graphs you generated in the previous step.

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What can you conclude by comparing the graphs of the different continents?

10 Compare your results with a classmate who chose different countries.

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How do your results compare to your classmates?

Reflection Questions: What do your graphs show about access? How can this information be used to make changes across the world?

FEEDBACK

We hope you enjoyed this activity! Please provide feedback about your experiences.

Tell us what you think!

CONCLUSION

1. How does access to electricity affect countries' access to computing innovations?
2. How can analyzing data like this be used to affect global change?

Proceed to next activity