

Graphing Your Plastic Debris Data

Microsoft Excel is a program for entering, storing, and analyzing data. It is available on most PC and Mac computers as part of the Microsoft Office package and is commonly used in many professions. Knowing how to use Excel is a valuable skill to list when applying for jobs.

We are going to use Microsoft Excel to enter and visualize our debris collection data for the campus plastic debris collection. This activity will give us a clear idea of what types of plastics are common in the campus environment, and thus likely to flow into the ocean through runoff.

Phase 1: Campus Debris Collection

1. Tally up the number of items for each plastic (number/type) that you found in your field data.
2. Open Excel. A blank document will appear.
 - a. Then save this document. Go to “File” and then to “Save As.” In the “File Name” box type a group name you will remember and the name of the activity and save the file to the computer desktop. Example: *TeamAwesome-Plastic Debris*.
3. Excel is already set up as a table (spreadsheet). All you have to do is label the rows and columns. Rows are the horizontal boxes labeled with numbers and columns are the vertical boxes labeled with letters.
 - a. Enter your data in three columns:
 - i. Column A will list the plastic number
 - ii. Column B will list the plastic type corresponding to the plastic number
 - iii. Column C will contain the number of items you found for each plastic number/type.
 - b. In the first row of each column, add a heading that describes the data you will enter in that column. Type “Number” in (Cell A1) and “Plastic Type” in (Cell B1) and “Number of Items” in (Cell C1). Your data entry should fill all cells from A2-A8, B2-B8, and C2-C8. (Look at the sample table on the next page for an example.)
4. In cell B9, type “Total”. In cell C9, type “=SUM(C2:C8)”.
 - a. This tells Excel to sum up all of the numbers in cells C2-C8 so that you can get a total number of plastic items for all types of plastic found. Your spreadsheet should look exactly like the table on the next page, but with your own data:

			Sheets
	A	B	C
1	Number	Plastic Type	Number of Items
2	1	polyethylene terephthalate	10
3	2	high density polyethylene	3
4	3	Vinyl or PVC	25
5	4	low density polyethylene	4
6	5	polypropylene	1
7	6	polystyrene	18
8	7	miscellaneous	9
9		TOTAL	70

5. Next, we want to calculate the percentage of our data represented by each plastic type.
 - a. Calculating the percentage helps us wrap our heads around what the data really means. For example, if I told you that we found 25 vinyl/PVC items on your campus, that wouldn't really tell you how common it is to find vinyl/PVC compared to other types of plastic. But if I told you that vinyl/PVC makes up 35% of all plastic found on your campus, you would know that it is a big part of campus debris, over a third of all items found.
 - b. To calculate the percent, click in cell D2 and type `"=(C2/C9)*100"`. You are telling Excel that you want to divide cell C2 (number of polyethylene terephthalate items, 10) by cell C9 (total number of items, 70) and multiply it by 100 to calculate the percent of the total items represented by polyethylene terephthalate. Press Enter.

6. Now click on cell D2 once and you will see a little black square appear in the lower right hand corner of the cell. Click that little square and drag it all of the way down to cell D9.
 - a. Excel has now automatically calculated the percentage of each plastic type, and to double check that everything is correct, cell D9 should say "100," because the total number of items represents 100% of the items.
 - b. Click on any cell in column D and you will see that the formula has changed to represent whatever row you are on. If you are in row 3, the formula says `"=(C3/C9)*100"` and if you are in row 8 the cell says `"=(C8/C9)*100"`.
 - i. The `C9` part of the formula, which represents the total number of items, always stays the same because of the dollar signs. Now your spreadsheet should look like this:

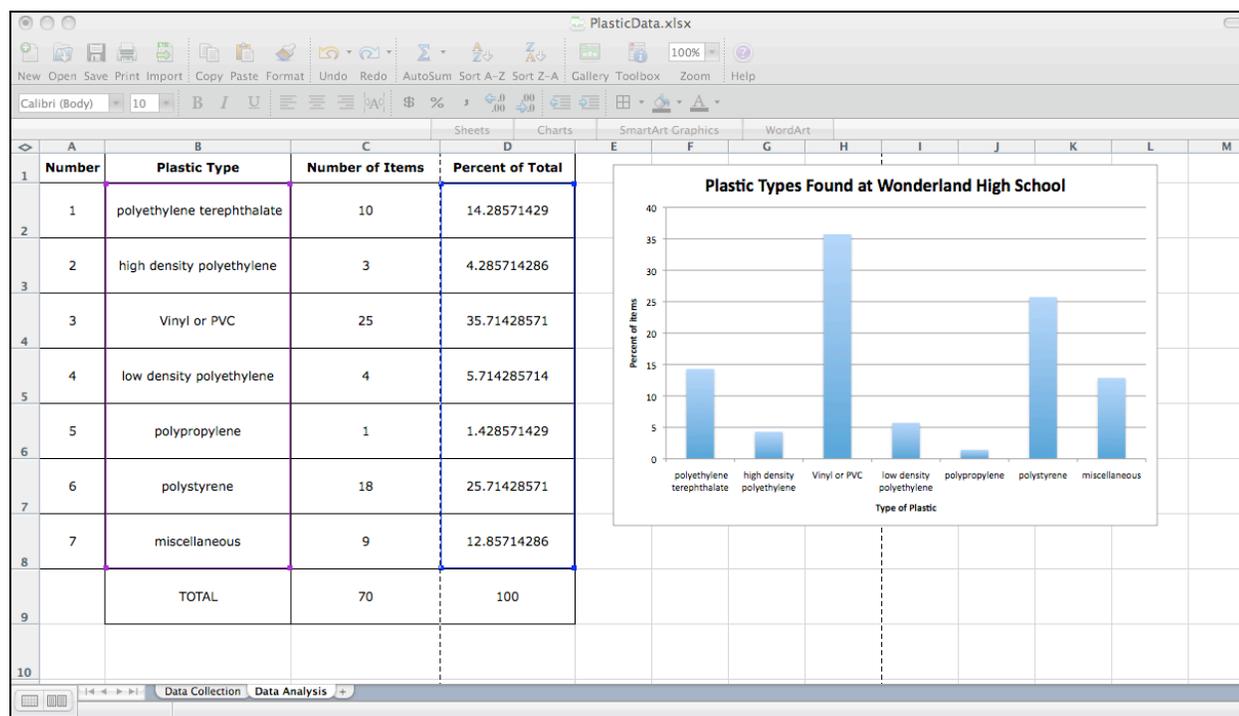
	A	B	C	D
1	Number	Plastic Type	Number of Items	Percent of Total
2	1	polyethylene terephthalate	10	14.28571429
3	2	high density polyethylene	3	4.285714286
4	3	Vinyl or PVC	25	35.71428571
5	4	low density polyethylene	4	5.714285714
6	5	polypropylene	1	1.428571429
7	6	polystyrene	18	25.71428571
8	7	miscellaneous	9	12.85714286
9		TOTAL	70	100
10				

Phase 2: Bar Graphs in Excel

Now we are going to graph our data to help us visualize the results. First we will make a simple bar graph with percentage of debris on the y-axis, and types of plastic on the x-axis.

1. In the upper right-hand corner of your menu bar, locate the little icon that looks like a chart. Click on it.
2. In the window of chart types, select “Column” and then click “Next.”
3. At the top of the window, click the tab labeled “Series.”
4. Now click “Add.”
5. In the “Values” box, delete anything already typed in the box, but leave the cursor in the box. Now on your main table, highlight your percentage data, from cell D2 to cell D8. Do not include the Total.
6. In the “Category (X) Axis Labels”, click the mouse and then highlight all of the plastic categories, from B2 to B8. Click Next.
7. In the next window, give your graph a title and label your axes appropriately.
 - a. You should label the x-axis with the type of categories and the y-axis with the type of data collected (and units, if applicable).

8. Click “Next” and then “Finish.”
 - a. Now you should have a completed graph and it will look like this. You may have to enlarge the graph to see all of the x-axis categories:

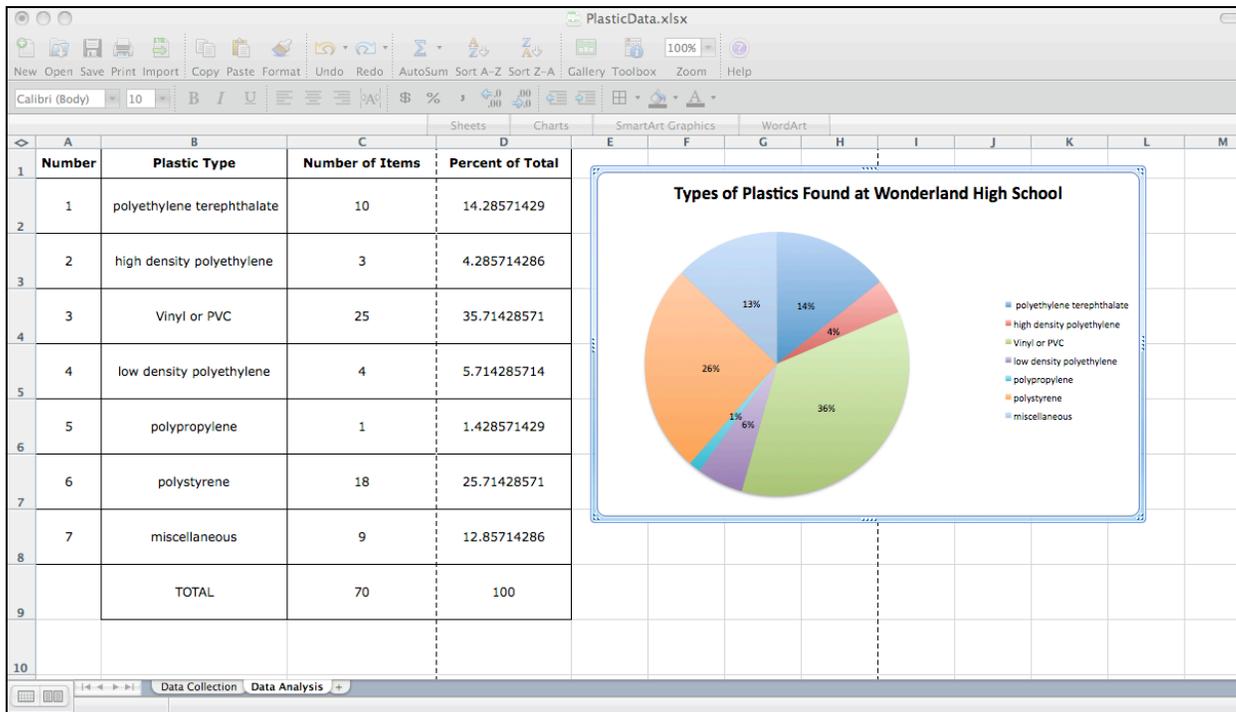


Phase 3: Pie Graphs in Excel

Though the bar graph tells a pretty clear story about our data and allows for easy comparisons between types of plastic, a pie chart is another really good way to show percentage data.

1. In the upper right-hand corner of your menu bar, locate the little icon that looks like a chart. Click on it.
2. In the window of chart types, select “Pie” and then click “Next.”
3. At the top of the window, click the tab labeled “Series.”
4. Now click “Add.”
5. In the “Values” box, delete anything already typed in there but leave the cursor in the box. On the original spreadsheet, highlight your percentage data, from cell D2 to cell D8. Do not include the Total.
6. In the “Category (X) Axis Labels”, click the mouse and then highlight all of the plastic categories, from B2 to B8.
 - a. Click Next.
7. In the next window, give your graph a title and label your axes appropriately. You should label the x-axis with the type of categories and the y-axis with the type of data collected (and units, if applicable).
 - a. Click “Next” and then “Finish.”

8. Right click on your graph and select “Format Data Series.” Then click on the “Data Labels” tab. Check the box for “Percentage” and then press OK.
9. Now you should have a completed pie graph and it will look like this:



Additional Activity

What type or types of plastic are most prevalent as debris found on your high school campus? Is this type of plastic one that may be harmful to aquatic or marine life due to the plasticizers used to manufacture it or other pollutants associated with it? (see Table 2 in paper or on website)

How would you calculate how much of a particular plasticizer or chemical (such as BPA, phthalates, nonylphenol, or styrene) is present in the plastic you found?

(ANSWER – weigh the total amount of plastic from a particular category ... say that Styrofoam (polystyrene) was the most frequently found type of debris. Convert the weight in kilograms or grams, depending on the units in Figure 3. Use the mean of the range of concentrations given in Figure 3. in the paper to calculate how much styrene (for example) is either contained in or could potentially migrate from the items you found on your campus.)