

Trophic Tower

STEM Sims

Lesson 3: Analyzing Electric Current Data

The photovoltaic cells of a solar panel capture sunlight and converted it into electrical energy. The circuit travels up to the top of the electrical tower powering light bulbs, but the brightness at each level is different. Can you find the relationship between the number of resistors in a circuit and the current through each device?

Doing the Science

1. Start the Trophic Towers Simulation by clicking on the “Sim” tab.
2. Click on “Electrical Tower” button and read the instructions provided.
3. Drag the ammeter to the “Primary” wire located on the right side of the tower.
4. Record the number of amps in “Current Strength” in Table 1.
5. Move the ammeter to each level and record the current strength.
6. A resistor is the represented by the gray coil of wire on the left side of the tower. For each level, record in Table 1 how many resistors are between the light bulb at a given level and the photovoltaic panel.
7. Click the Reset button and repeat steps 3 - 5 for Trials 2 and 3.

Table 1.

	Trial 1		Trial 2		Trial 3	
Level	# Resistors	Current (A)	# Resistors	Current (A)	# Resistors	Current (A)
Primary						
Consumers 1						
Consumers 2						
Consumers 3						
Consumers 4						
	$r =$		$r =$		$r =$	
	Average $r =$					

8. Enter your Trial 1 data only into a spreadsheet with the number of resistors being your column *A* values and the current in amps being your column *B* values.
9. Run a correlation (calculate the correlation coefficient, r) on the number of resistors and the current in amps. Record your r value in Table 1. A correlation close to +1 or -1 indicates a strong relationship between the factors. A correlation close to “0” suggests the two factors are *not* related. The Methods section of this module has a short video that shows you how to use a spreadsheet to calculate a correlation between two factors.
10. Repeat steps 8 and 9 for your Trials 2 and 3.
11. Calculate and record in Table 1 the average correlation coefficient (r).

Do You Understand?

1. Interpret the average correlation coefficient (r) in terms of strength and direction.
2. Create a scatterplot of your Trial 1 data only. Describe the graph’s appearance.

3. Create a scatterplot of your Trials 1, 2 and 3 data. Describe how the appearance of this new graph differs from the Trial 1 only graph. Explain why this is so.
4. Enter the following data into a new spreadsheet.

Student Class Average (%)	Teacher Attention per Week (minutes)
98	71
94	62
87	51
81	40
75	35
68	41
61	52
55	61
47	72

5. Determine the correlation coefficient (r) for Student Class Average versus Teacher Attention.

$$r = \underline{\hspace{2cm}}$$

6. Interpret the correlation coefficient in terms of strength and direction.
7. Create and print a scatterplot of Student Class Average versus Teacher Attention.
8. Run a correlation only on the class averages from 98 to 75. What is the value of r ?
9. Run a correlation only on the class averages from 75 to 47. What is the value of r ?
10. What do you think might be happening to the correlation coefficient for the entire data set compared to the two half-data set calculations?
11. What is a very important lesson learned (hopefully) from answering questions 4 – 10 in this section (Do You Understand)?