

Visualizing Physics with STELLA: Newton's Law of Cooling

Introduction

This lesson introduces students to Newton's Law of Cooling through a scenario-driven model titled "Coffee with the President and the Prime Minister". Students will be able to explore Newton's Law by manipulating temperature differentials and container insulating capacity.

What you need

To complete this activity you will need the "Coffee with the President and the Prime Minister" sample model and STELLA software. If you don't own a STELLA license, you can use the free isee Player software.

To download the model, visit:

<http://www.iseesystems.com/community/downloads/EducationDownloads.aspx>

To download the isee Player, visit:

<http://www.iseesystems.com/software/player/iseeplay.aspx>

Instructions

- 1.) Open the model in STELLA or the isee Player.
- 2.) Click on Background and Context to read about the problem you will be investigating. Return to the Home screen.
- 3.) Before clicking on Conduct Experiments, answer the following questions:
 - Whose coffee do you think will be hotter?
 - Why do you think so?

Conducting Experiments – Part 1

- 1.) Click on Conduct Experiments and follow the directions. Continue to the next screen and record the coffee temperatures below:
 - President's coffee temperature: _____
 - Prime Minister's coffee temperature: _____
- 2.) Continue to read the Understanding Why pages. After you have examined the graph, answer the following question:
 - What assumption is being made about the temperature of the cream added to the President and Prime Minister's coffee?

Conducting Experiments – Part 2

- 1.) Click on the Part 2 Experiments link. On this page you can manipulate the times that cream is added as well as the insulating power of the cups.
- 2.) Experiment with these inputs so you can answer the following questions:
 - What happens to the temperature difference at the end of each run as the time difference between when each person adds their cream increases? Why does this happen?
 - What happens to the temperature difference as the insulating power increases and decreases? Why?

About STELLA

Using STELLA modeling and simulation software, students can create models and run simulations of systems over time. The results of simulations are displayed with visual representations to support diverse learning styles.

Thousands of educators and researchers have made STELLA the gold standard; using it to study everything from economics to physics, literature to calculus, chemistry to public policy. K-12, college, and research communities have all recognized STELLA's unique ability to stimulate learning.

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