Goldilocks' Paradox

Brodeen, Samantha (School: Avon High School)

When it comes to the temperature of the porridge in the three different-sized bowls, the children's story "Goldilocks and the Three Bears" appears to violate the laws of physics. In this project, I first measured to see if the story could be true as told. Then, using Newton's Law of Cooling, I was able to determine the exact masses of fluid in each bowl that would make the story accurate. To simulate the porridge, I filled three different-sized bowls with the maximum amount of hot water and measured their temperatures over one hour. I also filled three different-sized bowls with the same amount of water and repeated the experiment. Both of these failed the "Goldilocks" test regarding the order of how the water in the bowls cooled. Next, I graphed the mass of water in each bowl versus the k-value found from the Newton's Law of Cooling equation for several different masses of water in each bowl. Using the k-value of the small bowl as a reference and the equation from the graph, I was able to calculate the maximum amount of hot water in the middle-sized bowl and the minimum amount of hot water in the large-sized bowl to confirm the "Goldilocks" story. The results of my experiment are a useful exercise in using the scientific method to analyze possible misconceptions found in literature. Results could also be used to strengthen science education in elementary schools. Finally, I am currently analyzing to see if there is a relationship between the k-value, mass, and surface area of the bowl.

Awards Won: