

“The Puzzle” In Life

Think of a puzzle. First, you complete the outside, then you fill the inside. You try to match each piece with another as you sort pieces into categories and try different fits. As you approach the end, the puzzle becomes easier. When you finish, you feel a sense of accomplishment. Dr. Lori Siegel uses a similar integrative approach in her work as a climate engineer.

Dr. Siegel has always been drawn to how things work. In her early childhood, she took regular household items apart just to learn how to put them back together again. She loves to know how the world works. Growing up in Providence, Rhode Island, she discovered that math was more than just another form of science. She realized that math shows up everywhere. This realization eventually led her to do what she is doing today as a mathematician. Siegel was curious, so she asked questions and got answers. As an adolescent, she started calculus and partial derivatives and realized that complex math describes the world. Siegel describes her passion for calculus and her way of solving problems as the following:

“You can take something that has an infinite number of slopes along the way, and you can break it down with the little squares or rectangles, and you can simplify it. Like, every complicated math problem, you can simplify it. You can break it down into what does this really mean, what is the question I am really trying to get at, and how is it realized in the real world?”

Once she understood this thought process, math became easier. She was tackling more and more complex problems as she continued to learn. Her teacher made math fun and encouraged her to push herself in both math and science. While in high school, a college student gave her extra lessons in advanced math.

In March 1989, a teacher showed her class pictures of the Exxon Valdez oil spill. She described seeing those pictures of pristine Alaskan waters turned into an oil-filled mess as a terrible experience. She wondered how we could let this happen and was astounded at the substantial difference that one oil tanker could make. She thought about the animals and ecosystems that would die because of this tragic disaster. But seeing this also motivated her in a novel way: it convinced her she needed to do something about our critical climate crisis. As she continued into college at Tufts University, she carried her ideas about the crisis with her.

At college, there were few women in her math classes, yet she paid this no heed. Dr. Siegel never felt held back because of her gender. She majored in environmental engineering. While in graduate school, an advisor on her doctoral research team suggested she use a modeling approach called System Dynamics. She found it to be a great program for graphing real-world situations. She worked in climate-related jobs for a few years before going back to school at Northeastern to earn her doctorate. She met some people who were hoping to start a program that could help solve real-world problems by illustrating how different scenarios would affect the population. As someone conscious of climate change, she joined the team.

“When I found out that there was actually a job I could do that uses math and science, I was like, yeah, sign me up.”

She majored in engineering and began working at Climate Interactive. Using System Dynamics, her nonprofit organization has created graphs and charts that are available to anyone. They are easy to

understand for someone without advanced knowledge, and this makes them popular with the general population. Activists use her programs to see how to best combat climate change. Even the Senate has worked with Climate Interactive. Every day she solves problems and finds solutions. Through math, she can test scenarios like how eating less red meat could affect the climate and then can graph her data. Her most popular work is called En-ROADS or Energy Rapid Overview Assessment Decisions Support. This program helps users test scenarios and policies that relate to energy systems. She also has illustrated the impact that having a carbon price or subsidizing renewables could have on our climate.

Solving problems is a daily project for Dr. Siegel and something she enjoys. She looks to history to find answers and find a basis for her ideas. Along the way, she must calculate complex math problems. Dr. Siegel likes to think about the big picture and put things into context. It is important to know how each of the components and feedbacks affects the problem. She synthesizes data sets to get an ultimate solution. When asked about these methods she said: "You can't just consider different pieces of the puzzle, you have to see how the puzzle pieces fit together. When you do, it's like, score!" Once she has found the problem, she can then use these tools to solve it.

Every day she uses logarithmic tools, raises solutions to exponents, and uses calculus and integration. Dr. Siegel takes important problems and works with history, math, and science to solve them. She completes these puzzles, and her team takes her results to the world. Dr. Lori Siegel helps combat climate change daily using her math skills.

About the Author:

My name is Ben Hourdequin. I am a 7th Grader at the Richmond Middle School who enjoys all academic subjects. I am also interested in piano, politics, cross-country skiing, and running. I have recently finished hiking the New Hampshire four thousand footers. In math, I enjoy working through algebraic concepts in my honors algebra one class.