

“Coding as a Playground: Programming and Computational Thinking in the Early Childhood Classroom” by Marina Umaschi Bers

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A Drawing Turtle

Cindy is a kindergartener who is just beginning to spell and write basic words. She hasn't had much experience using a computer or keyboard but is excited that she will be visiting the computer lab with her class today. She loves to play games in computer class. At the computer lab, her teacher, Ms. Santos, explains that today they will be learning how to program. “A program is a list of instructions that makes something happen onscreen,” she says. Ms. Santos shows them how to program using Kinderlogo. This version of LOGO allows young children to explore programming freely by moving a little graphical “turtle” around the computer screen using letter commands instead of full words. Unlike more complex languages, including other versions of LOGO, Kinderlogo makes it easy for young children who are “prereaders,” like Cindy. Instead of spelling and typing out long commands such as “forward,” “right,” “left,” etc., the turtle can move with simple keystrokes. For example, Ms. Santos shows the children that they can press the F key to make the turtle go forward, R to make it turn to the right, and L to make it turn to the left. As the turtle moves around on the screen, it draws a line as if a pen were attached to it. The kids are delighted to see how the turtle can be programmed to draw shapes!

Ms. Santos asks the children to program their own turtles to draw their favorite shapes onscreen. Cindy remembers that pressing the “F” key makes the turtle go forward and pressing “R” makes the turtle turn right, but she has very little experience using a keyboard and has trouble finding the letter keys. She has many problems to solve in order to program her turtle: remembering the correspondence between each key on the keyboard and the actions for the turtle, figuring out the right order to press the keys to create a shape, all while navigating a keyboard of letters when she is still learning the alphabet and how to type. This process proves frustrating for Cindy, who is having trouble finding any key except “F” on the keyboard.

Ms. Santos sees that Cindy is struggling. She sits with her to better understand her frustration. She quickly realizes that Cindy understands the concept of programming and the steps she needs to take, but she has a hard time with the keyboard. She helps Cindy out by putting colorful stickers on the F, L, and R keys so she can find them easily. Now Cindy can focus on sequencing her program in the correct order to create a shape. Cindy wants to draw her favorite shape, a square. First she draws a straight line and then iteratively adds new ones. She also tries out the different turn commands until she gets it right. She has to stop often to make changes and fix things that do not work. Twice she even decides to start over and make a whole new square. By the end of computer class, she has a square onscreen. “Look! Ms. Santos! Look! I programmed my turtle to draw square!” Cindy beams with pride as Ms. Santos helps her save a screenshot of her program and the square so that she can print them and take them home. As she hands Cindy the printouts, Ms. Santos reminds her how hard she worked in class today and tells her to make sure she shows her parents the printout of her code, too, not just the final square she made. Cindy nods and says she already has a plan for the next time

she gets to use Kinderlogo. "Next time, I'm going to try to program the turtle to draw my whole name," Ms. Santos smiles and challenges her to find the different shapes hidden in the letters of her name.

Sean, Suzy, and Cindy are all engaged in computational thinking by using different programming environments. They explored powerful ideas of computational thinking and, most importantly, had fun in the process. They engaged with coding in a playful way.