Sequencing Pixels
Unplugged



In this lesson, students play with the order of commands in unplugged Pixel Bot exercises. The lesson explores a foundational concept in computer science—sequence.



#### **OBJECTIVES**

- Know that computers run code in a sequence.
- Read, write, and execute code in a sequence.



#### **AGENDA**

#### Length: 45 minutes

Demonstrate how coders shape our world. (10 minutes) Present an array of examples of where we find code in the modern world. Consider autonomous cars, music, online communities. Watch "A Day in the Life of a Software Engineer" (http://tinyurl.com/q966xd5).

Unearth students' ideas about computer sequencing. (15 minutes) Using Lesson 1 | Warm-up Worksheet: Students develop ideas about how the arrow and paint elements work in Pixel Bot. Students step through and enact the two programs in the worksheet. Gather students' ideas about computer sequencing and show how a slight change in sequence alters the outcome.

Demonstrate how to read a program like a computer. (10 minutes) Draw a Pixel Bot program and grid on the whiteboard (3 or 4 lines of code, 3 x 3 grid). Work with students to step through and enact the program. Show the usefulness of numbering lines of code. Repeat a few times with new programs.

Support students' practice of reading programs. (10 minutes)
Using Worksheet 1 | Page 1 & Page 2: Students step through
and enact the programs by tracing the route of the pixel bot and
shading in any squares that it paints. (10 minutes)



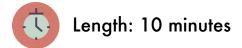
## CONTENT KNOWLEDGE

 Sequence - The idea that statements must be performed in the order they are written.



- 1. Lesson 1 | Warm-up Worksheet
- 2. Worksheet 1 | Page 1 & Page 2
- 3. Small pixel bot cutout for each student
- 4. Magnetic pixel bot
- 5. Scratch paper grids
- 6. Pencils
- 7. Whiteboard
- 8. Queued up video: http://tinyurl.com/q966xd5





	Teacher Actions	Student Actions
1	1 Lead a discussion:  What does it mean to be a coder?	1 Coders:  Work on computers Hack things Create video game
	Where do we use c ode?	s Make websites Work with data
	Chart responses on the whiteboard.	Phones Computers Traffic lights Spaceships Game consoles Movies and tv sho ws
2	Offer other examples:  Autonomous cars Streetlights Music Flight simulators And on and on	
3	Watch video: A day in the life of a software engineer: http://tinyurl.com/q 966xd5	



# PREDICT PIXEL BOT ICONS



### Length: 15 minutes

	Teacher Actions	Student Actions
1	Distribute [Lesson 1   Warm-up Worksheet][warm- up].	
2	Introduce reading code with care:  Imagine being a computer when you read code.	
	As computers, we read carefully. We pay attention to every detail. Every line of code.	
3	Have students interpret the coding elements in the warm-up:	3 Possible Responses:
	What do you think	The bot rotates i

n place. these elements d The bot jumps. The bot moves unt il it hits the ed The bot shoots li ghtning. **Correct Responses:** The bot moves one square at a time The bot moves up, right, left, and down. The bot paints. Trace the movement Individual Work: Have students fill of the Bot. Paint out the worksheet. with the Bot. While students code, draw the worksheet's programs and grids on the whiteboard. I arrived at my Reflect on 6 answer by: sequence: How did you arriv Reading one eleme e at your answer? nt at a time. Moving the bot af ter each element. Following the cor rect sequence. What is the diffe rence between the two programs? The two programs: How does the orde Have elements in

r of the icons ma different orders. tter? Order matters because: The bot paints a different square. Call out lines of Solve the two warm-7 7 up problems code and bot together on the actions. whiteboard. Work as a class to Work as a class to 8 8 figure out what define each each element makes element. the bot do.



# DEMONSTRATE HOW TO READ AND STEP THROUGH PROGRAMS

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Length: 10 minutes

	Teacher Actions	Student Actions
1	Draw a blank 3x3 grid on the whiteboard.	
2	Write a short (3 or 4 line) program on the whiteboard.	
3	Explain sequence:	
	When a computer e xecutes code, it steps through the code in the correct order. This is called sequencing.	
4	Read the first line of code together:	4 Students call out the first line of code.
	What is the first	

	line of code?		
	Number the first line of code.		
5	Move the Pixel Bot after reading each line. Trace its path or shade in a square.	w	tudents call out where Pixel Bot hould move.
6	Continue reading and stepping one line at a time.	h	itudents continue elping to read the ode.
7	Read and step through three new examples with the class. Design problems on the fly, making them interesting and complex enough.		



# **READ PIXEL BOT ICONS**



### Length: 5 minutes

	Teacher Actions	Student Actions
1	Distribute Worksheet 1: [Page 1][worksheet1-1] & [Page 2] [worksheet1-2].	
2	Leave the worked example from the previous activity on the whiteboard.	
3	Individual Work: Ask students to individually fill out the worksheet.	3 Students read the code, trace the pathway of the pixel bot, and paint the correct blocks on the worksheet.