Python Turtle Graphics

Focus: Introduce Python programming via vector graphics using a cursor (turtle) on a canvas

Standards:

Primary Objectives:
- Students will learn the basics of programming in Python
- Students will create their own Turtle designs by editing the code provided by the instructor

Secondary Objectives:

Estimated Time: 45-60 minutes

Resources:

School	TECH CORPS	Instructor/Volunteer
Student access to Trinket through a web browser		
Computers		
Projector		

Planning Notes:
- Student content can be found in a GitBook located in the Supplemental Resources section of this lesson.
- Please make sure you are familiar with Python, Turtle, and Trinket by reviewing the lesson plan and activity documents prior to the lesson. There are many different ways to accomplish the goals of this lesson in the platform.
- Feel free to let students change and create as they feel. This lesson is structured to help prepare students to create their own project, but there are many benefits to letting students work freely as they follow along.
    - They can change the colors to their liking.
    - They can move the turtle any way they want.
- One of the easiest ways to make interesting designs is to update the numbers in example code. If a student struggles to change these on their own, suggest a few numbers they can try to change.
- At minimum, show students the basics (drawing a triangle, using a loop) along with a few of the more interesting examples found in the Supplemental Resources section of this lesson. This should give students enough examples to be able to play around on their own.
- Students may work in pairs for this activity. Pair programming is a technique in which one student writes code, while the other student observes, constantly checking for mistakes. The two partners switch roles frequently. Pair programming adds the benefit that errors can be caught and fixed early in the development process.

Activity:
1. Introduction to Programming, Python, and Trinket
    - Ask the students what they know about programming and Python.
    - Ask the students if they like to draw and what they like to draw.
    - Direct the students to the starter Trinket link in the Supplemental Resources and explain the basic layout.
    - It is possible to increase the code font size from the hamburger menu.
2. Python Code-Along
    - Using the Python Code-Along activity document as a guide, allow students to follow along as they create their own project using Turtle.
    - Optional extra sections have blue labels and can be easily skipped for time.
    - For the code-along portions, the instructor should follow the instructions and write the code in a Trinket. The students should see the code the instructor types and type the same code on their computers. The instructor can ask leading questions and allow the students to suggest what to type next.
    - There are challenges built into the instructions, which give the students an opportunity to update the code on their own. Challenges are meant to be completed by the students without direct instruction from the teacher.
    - Loops are powerful for creating interesting designs. The students can update the number of repeats, along with the turn angle and the forward distance, to create cool shapes. Using the basic loop code, they can complete the many-pointed star challenge.
3. Python Challenges
    - Direct the students to the Python Challenges. A link has been provided in the Supplemental Resources section of this lesson.
    - The instructor can walk through one or two of the challenges (including the many-pointed star) to give students an idea of what they can create using Turtle.
    - The main purpose of the challenges is to inspire students to continue playing with the code. If they want to update their code in a completely different way, the instructor should encourage them to try new things as they wish!
4. Turtle Examples
    - These examples show the students more advanced Turtle graphics with Python.
    - The students can take the example code and customize it.
    - The students can also copy the code and update their projects with it.

Supplemental Resources:
- Student Content: https://hylandtechoutreach.github.io/CSEdWeek/
- Interesting Examples: https://hylandtechoutreach.github.io/CSEdWeek/TurtleExamples.html
- Starter Trinket Bitly Link: bit.ly/PyTrinket
- Python Challenges Bitly Link: bit.ly/PyChallenges
- Turtle Graphics Wiki: https://en.wikipedia.org/wiki/Turtle_graphics
- Trinket Python Documentation: https://trinket.io/docs/python#turtle
- RGB Color Picker: https://www.google.com/search?q=color+picker