LED
Grades 6-12
Designed by Robolink

Summary:
Students may have seen that their drones have LEDs, but they haven't really had the opportunity to do anything with them. In this lesson, students will learn how to program their CoDrone EDU's LED and will then apply their knowledge to create a drone light show.

Guiding Question(s):
- How do you program a CoDrone EDU's LED?
- How can the LED be used in a flight program?

Learning Objectives:
Students will be able to:
- Create and run a program to change the LED's colors
- Incorporate LEDs into their CoDrone EDU's flight movements
- Choreograph a drone light show

Materials needed:
- CoDrone EDU, remote, and USB cable for each student or student group
- Laptop with Internet access and PyCharm EDU installed for each student or student group
- Charged CoDrone batteries and extra chargers

Lesson Title: LED **Time:** 1 hour 30 minutes

Engagement: (Introduction)
- Ask students what they think quadcopters, especially their CoDrone EDU, can do. Ask if they've ever seen a drone light show, and then show them the videos below. After it's finished, ask them if they have any observations, thoughts, or questions, and then ask what they think some of the difficulties of planning a drone light show would be.
    - **Video:** Intel | Experience the Team in Flight at PyeongChang 2018
    - **Video:** NEW YEAR 2020 Drones Show Shanghai

Exploration: (Activity)

- Have students complete LED on Robolink Basecamp. This includes the challenge at the end of the lesson. If students are having problems, they need to talk to classmates before asking the teacher!

Explanation: (Recap)

- Ask students to use pseudocode to explain their I Can See A Rainbow program to a partner, using both their own words and the appropriate academic language.

Elaboration: (Extension)

- Have them choreograph a drone light show. Ideally, this should be done in groups, but if this is not possible, students can work on their own. They can use the videos shown during the engagement activity for inspiration, and they can also find more online. When everyone is finished programming and practicing, have each team or student present to the class.

Ideas for extra challenges:

- Have students pick a school-appropriate song to use for their light show. They can time the LEDs and CoDrone EDU's movements to this song.
- Assign students certain flight movements or LED patterns that they need to include for technical points, like ice skating and gymnastics.

Evaluation:

- In a journal or on a worksheet, have students answer the following questions. An example of an engineering portfolio is available on Google Sites.

1. Explain your CoDrone EDU light show program using pseudocode.
2. What was the most challenging part about choreographing a light show? What did you enjoy the most?
3. Did you have any problems running either of your codes? If so, what did you do to fix them?
4. What did you learn?

Related Vocabulary: default, drone, landing, LED, library, loops, mode, movement command, negative, parameter, pitch, positive, Python, roll, takeoff, throttle, yaw

Standards:

CCSS:

ELA-LITERACY.RST.6-8.3: Follow precisely a multistep procedure when carrying out

experiments, taking measurements, or performing technical tasks.
ELA-LITERACY.RST.9-10.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
ELA-LITERACY.RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
MATH.PRACTICE.MP1: Make sense of problems and persevere in solving them.
MATH.PRACTICE.MP5: Use appropriate tools strategically.
MATH.PRACTICE.MP7: Look for and make use of structure.

CSTA:

2-CS-03: Systematically identify and fix problems with computing devices and their components.
2-AP-16: Incorporate existing code, media, and libraries into original programs, and give attribution.
2-AP-19: Document programs in order to make them easier to follow, test, and debug.
3B-AP-16: Demonstrate code reuse by creating programming solutions using libraries and APIs.

ISTE:

5D: Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.
6A: Students choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.