Lesson Plan 3

Discovery of Unmanned Aviation

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Discovery of Unmanned Aviation: Lesson 3

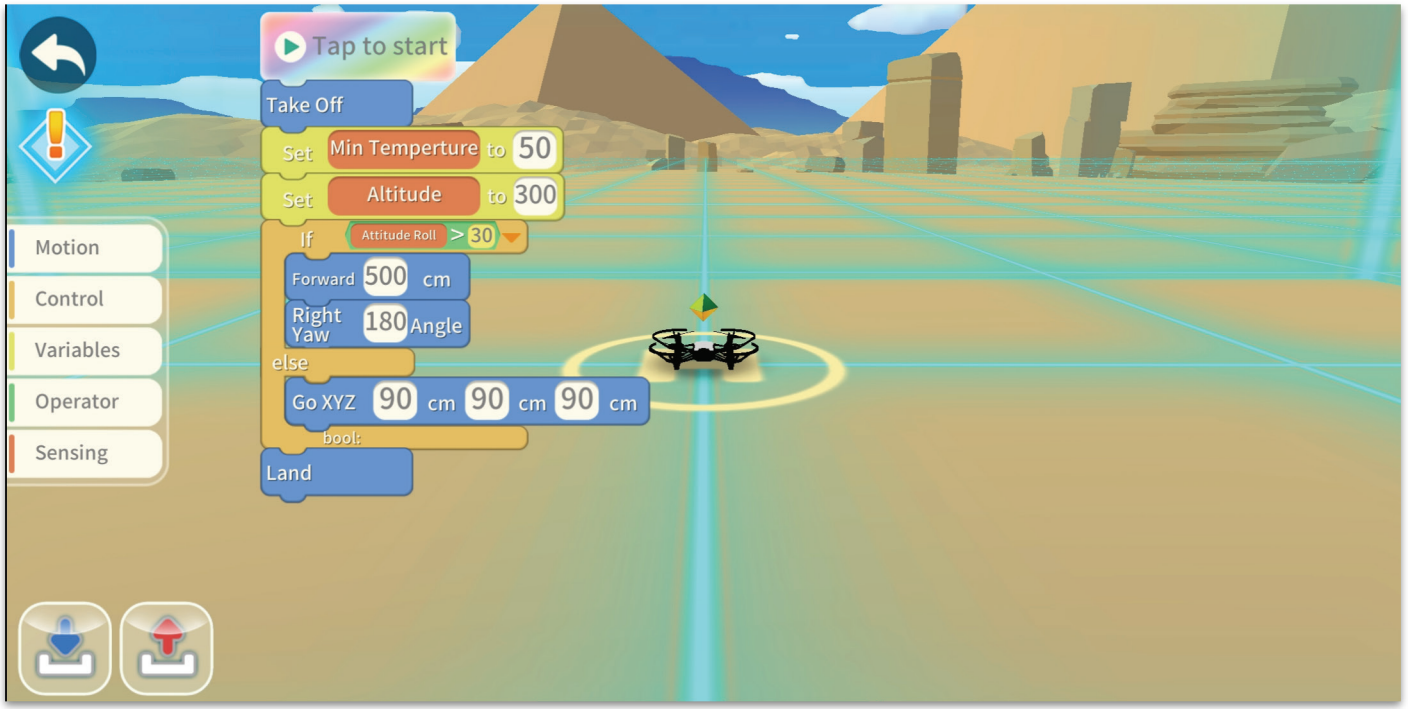
What is Scratch?

What is

https://scratch.mit.edu/

Scratch is

- A language to speak to machines that uses pre-set coding blocks.



Learning Targets

- I can identify components of Scratch programming language.
- I can construct and follow a set of sequential instructions.

Uses for Scratch

Scratch is a block based language that's perfect for:

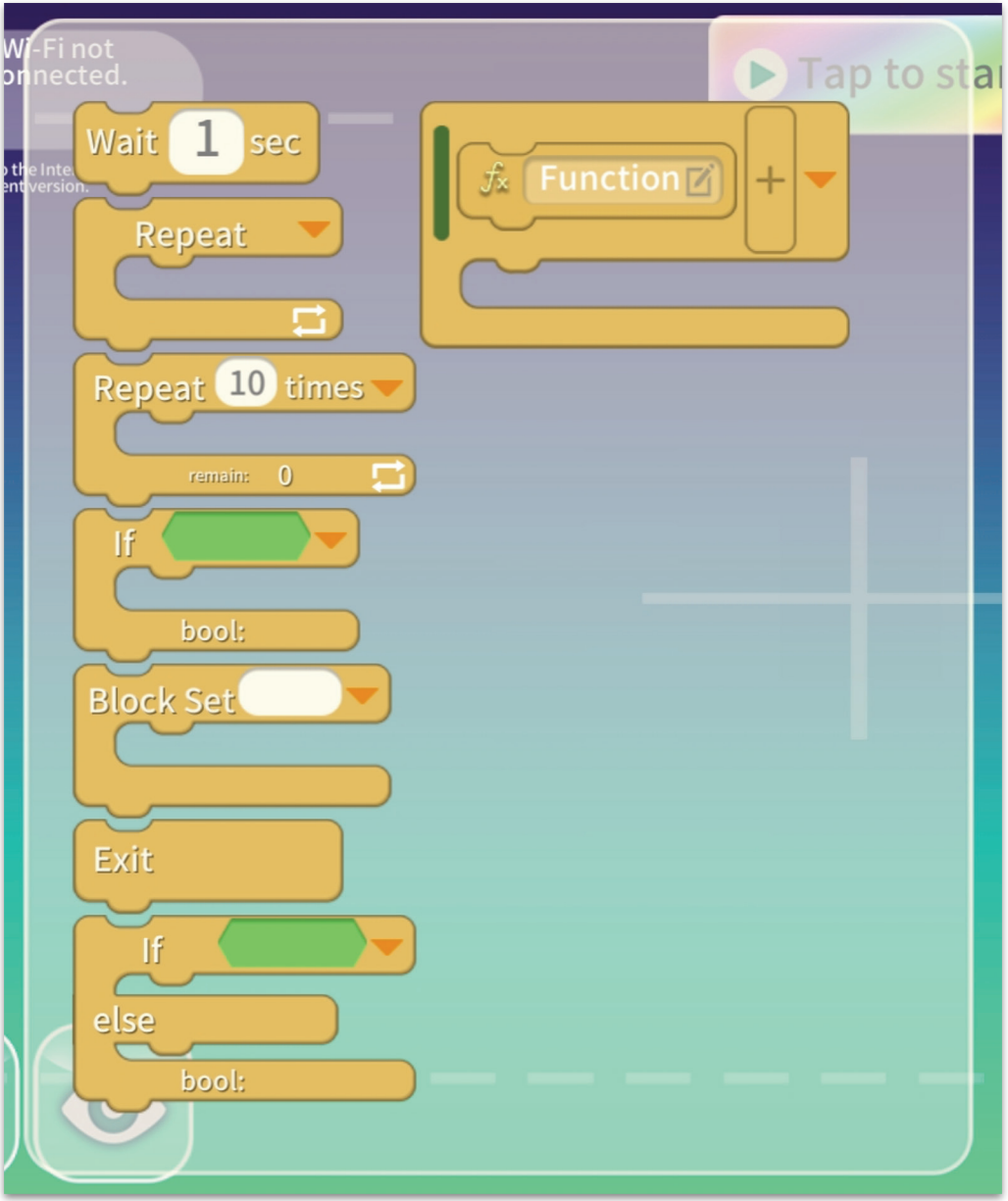
- **Coding robotics platform**
- **Coding video games**
- **Creating art and videos**

What is Coding?

Coding is

- A set of instructions for machines to follow.
- A language. A way of “talking” that machines understand.

Block Categories



Block Categories

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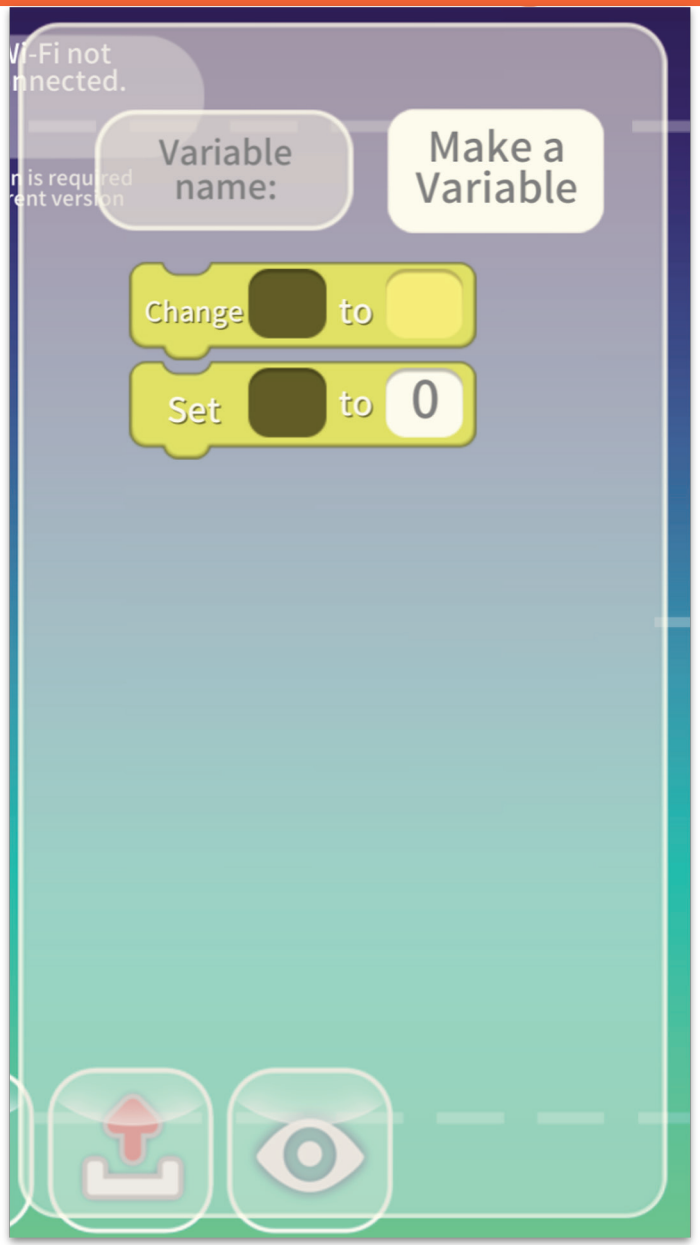

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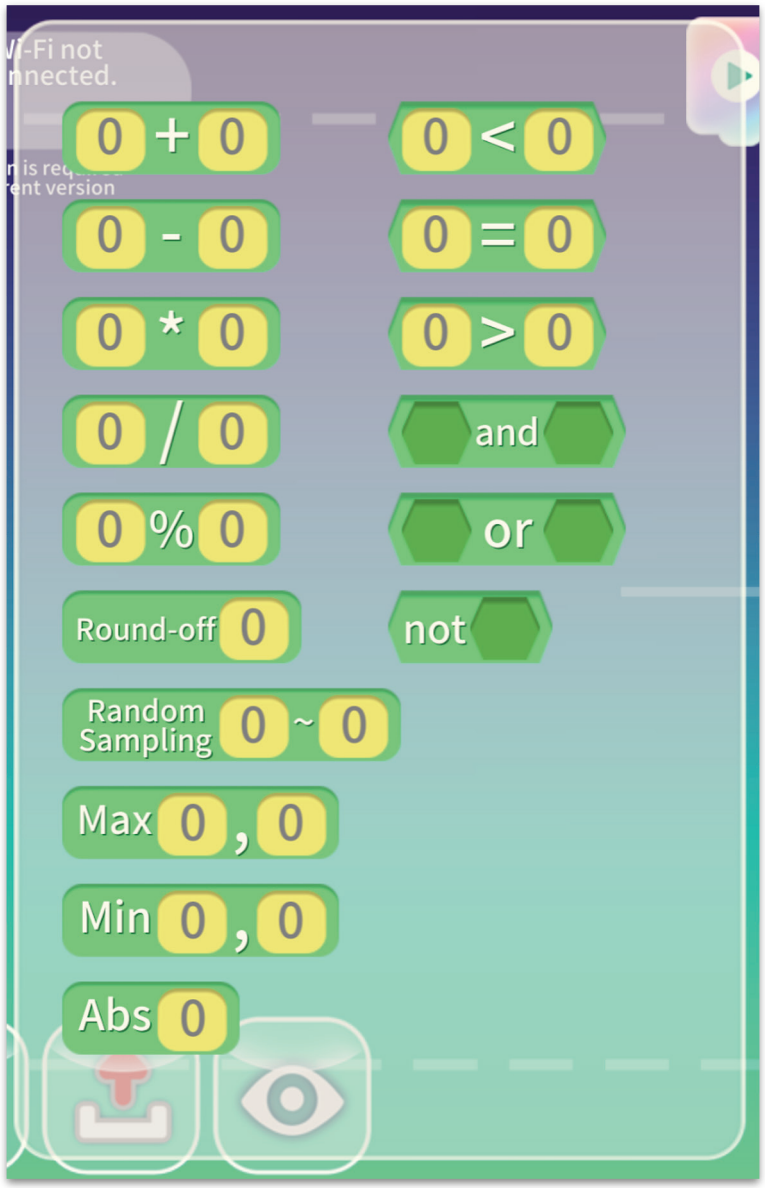
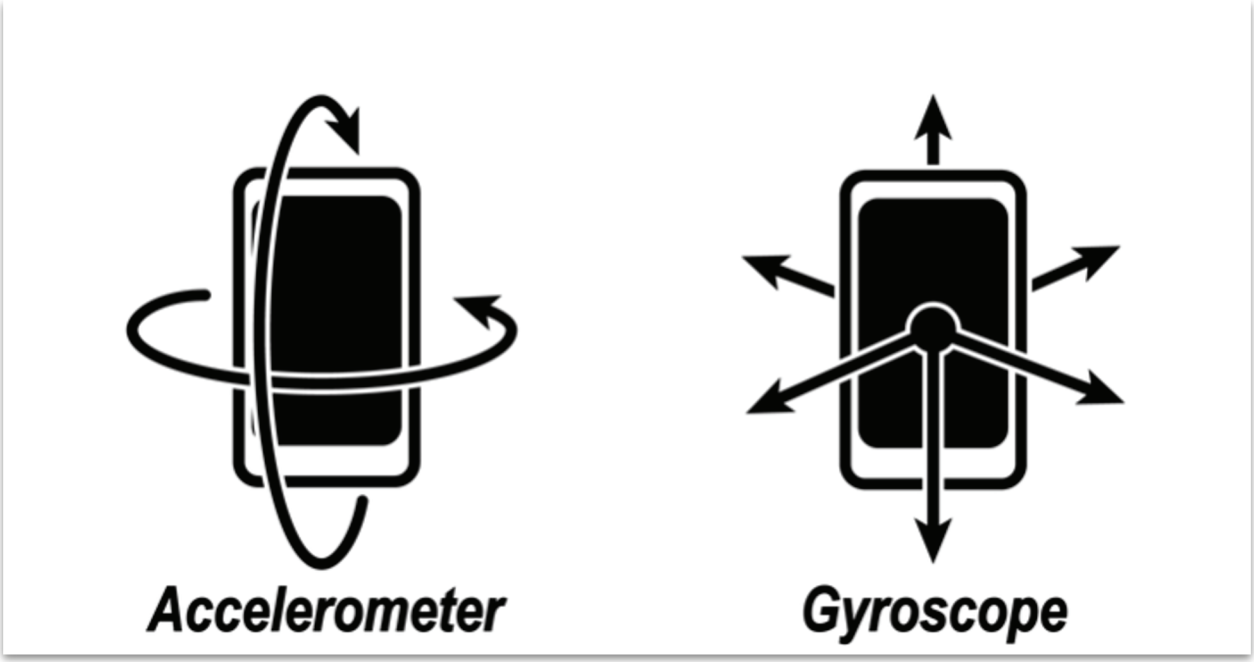


Drone Sensors



Gyroscope: Senses how much the drone has yawed, pitched, or rolled.

Accelerometer: Senses how fast the drone moves forward, backward, left, right, up or down.

What is Sequence?

Sequence is

- a specific order of events to follow in order to get a particular result.

How to Make an Origami Hat:

1. Start with a square piece of paper,
2. F**old** the top down to the bottom edge
3. **Fold** the top corners down to the centre line.
4. **Fold** the bottom edge (uppermost layer only) up to the base of the triangles.
5. **Fold** this part up once again, and crease well.

Create a Sequence

What is the sequence of steps necessary to travel from your school to the gas station?

Create a Sequence

What is the sequence of steps necessary to make fresh pancakes?

Create a Sequence

What is the sequence of steps necessary to build the tallest possible tower using playing cards?

Coding the Drone

In order for drones to be successful, they need to do two things:

- know where they are
- measure how far they travel

Learning Targets

- I can identify components of Scratch programming language.
- I can construct and follow a set of sequential instructions.

Discovery of Unmanned Aviation

Lesson 3 What is Scratch?

LESSON SUMMARY

In this lesson, students will learn about Scratch programming language, sequential coding logic, and how machines accept instructions.

LEARNING TARGETS

- I can identify components of Scratch programming language.
- I can construct and follow a set of sequential instructions.

STANDARDS SUPPORTS

NGSS

Crosscutting Concepts

- ❑ **Influence of Science, Engineering, and Technology on Society and the Natural World**:
  - ❑ Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)

ISTE

Empowered Learner Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

21st Century Skills

- ❑ **21stCS_1** Critical thinking, problem solving, reasoning, analysis, interpretation, synthesizing information.
- ❑ **21stCS_11** Scientific literacy and reasoning, the scientific method.

INSTRUCTIONAL MODEL

1. Engage: Introduction to Scratch (10 min.)
2. Explore: What is Coding (15 min.)
3. Explain: Building Sequential Instructions (5 min.)

4. Elaborate: Drone Sequence Activity (20 min.)
5. Evaluate: Learning Review(5 min.)

MATERIALS

- Laptop/tablet (for PPT display)
- Classroom whiteboard and markers
- Student Worksheet for Lesson 3
- Lesson 3 Powerpoint
- Drone Sequence Activity

LESSON PLAN

Engage: Introduction to Scratch (5-10 min.)

- **Slide 2: Introduce the topic:**
  - **ASK:** Have you ever heard of or used Scratch before? If so, share what they did, how they liked it, and what if any challenges they had.[RM NOTE: Call on each person in the class to make sure you assess individually who has and who has not used Scratch prior to this. Use the information to inform the level to which you need to introduce Scratch to the learner].
- **Slide 3: Scratch is**
  - Explain that Scratch is a block-based coding language program that allows you to code an object or "sprite" without having to know all the technical details of coding.
- **Slide 4:**
  - Display the Learning Targets and invite a student to read each one aloud. Ask students what they know about each to determine if they have any prior knowledge or misconceptions.
    - I can identify components of Scratch programming language.
    - I can construct and follow a set of sequential instructions.

Explore: What is Coding (10 min.)

- **Slide 5:** Uses for Scratch
  - Show the students several different projects that have been created in Scratch.
  - **ASK:** Compare and contrast these projects in Scratch. How are they the same? How are they different? [TEACHER NOTE: Show on screen the different projects of which the students are speaking about as they share their thoughts. As students are talking make sure to highlight with your cursor the different aspects of the project to which they are referring so everyone can see and be focused on the same thing.]
- **Slide 6: What is Coding**
  - Tell students that today they are going to learn about Scratch and coding the drone, which will be used for the rest of the course. Explain that the drone is not a toy; it is designed to help us learn.

    - **ASK:** What is Coding?
- **Slide 7:**
    - Explain to students that today they are going to study Scratch as a way to give computers step-by-step instructions. Explain that computers receive instructions using code and programs.
    - Tell students that computer code is a way to talk to computers, and it is the only way that machines are able to understand our instructions. Just like humans have different languages, computers also use different languages, or code.
    - **ASK:** What are different ways we can give instructions? [Student responses will vary. If necessary, encourage students to think about the different ways their parents or teachers provide direction: in writing, orally, or through a combination of both.]

Explain: Learning Scratch Components (15 min.)

- **Slides 8-12:**
    - Review the various categories of Scratch blocks that students will use to give their drones instructions, and explain each one to students.
- **Slide 13: Drone Sensors**
    - Explain that in order for a drone to fly by following the coded instructions, it must have sensors that can tell it's speed and it's direction and where it is in space..
    - **ASK:** What is an ***accelerometer***? Remind them of the word they have heard before - acceleration. [Senses how fast the drone moves forward, backward, left, right, up or down.]
    - **ASK:** What is a ***gyroscope***? [Senses how much the drone has yawed, pitched, or rolled.]

Elaborate: Drone Sequence Activity (20 min.)

- **Slide 14-15:**
    - **ASK:** What is a sequence? [Student responses will vary. Help students to understand that sequences are a particular order in which related events, movements, or things follow each other. Sequences are being used around us all the time and are important to accomplishing tasks.]
- **Slide 16-18:**
    - Encourage students to describe how to complete simple tasks. Examples might include baking a cake, playing their favorite video game, or solving an algebra problem.
- **Slide 19: Coding the Drone**
    - Tell students that in order to move from one place to another, drones need to do two things; know where they are and measure how far they travel.
    - **ASK:** Define a sequence of actions a drone might use to fly to locations in the room.
    - Now have students walk the route they just defined and record those directions as their instructions for their drone.
    - **ASK:** What components of drone flight do we need to consider when writing routes for drones? [Student responses will vary. Guide students to notice that because a drone is flying, the drone has to have an awareness of height and obstacles.]

- Tell students that a “smart” drone can avoid obstacles and not crash, but it needs a lot of instructions that allow it to move but also make decisions.
- Divide students into groups of 3-4.
    - Distribute the Drone Flight Sequence Student Worksheet to each group of students, and give them time to record the sequence.
    - If time allows, invite each group to share their instructions with the class.

Evaluate: Learning Review (5 min.)

- **Slide 20:**
    - Display and read each Learning Target and invite students to reflect on their learning by showing a thumbs up, thumbs down, or thumbs to the side for each one to indicate their progress.

Name: _____

Drone Flight Sequence

Design a flight sequence for your drone. Write the list of step by step instructions your drone and operator will follow below. Consider the constraints and criteria outlined below when designing your sequence.

- Make sure to adjust the classroom so you have enough room to walk without obstructions.
- Form groups of 2 to 3.
- Define a starting point and ending point at the same place in the classroom.
- Your routes must have 10 components that you can write as a sequence.
- Your sequence must avoid all obstacles.
- In your groups, walk a route around the classroom in which you start and return to the same point.
- Write the different steps in the sequence based on your route around the room.
- Drone and human safety must be a priority.

Drone Flight Sequence

1.

2.

3.

4.

5.

Name: _____

6.

7.

8.

9.

10.

Fly your drone. Was your sequence successful in getting the drone from the start and back again? Why or why not? Modify your sequence above if necessary.

Name: _____

What was the most challenging part of developing a flight sequence?

_____

_____

_____

What was the most exciting part of this lesson?

_____

_____

_____

Name: _____

Drone Flight Sequence

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- Write the different steps in the sequence based on your route around the room.
- Drone and human safety must be a priority.

Drone Flight Sequence

Students' answers will vary. Evaluate the steps based on the success of the flight and the meeting of the criteria and constraints outlined above.

1.

2.

3.

4.

5.

Name: _____

6.

7.

8.

9.

10.

Fly your drone. Was your sequence successful in getting the drone from the start and back again? Why or why not? Modify your sequence above if necessary.

Students' answers will vary. Evaluate their assessment based on the success of the flight and the meeting of the criteria and constraints outlined above.

What was the most challenging part of developing a flight sequence?

Students' answers will vary.

What was the most exciting part of this lesson?

Students' answers will vary.

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