

COURSE: Discovery of Unmanned Aviation

Designed for learners in Grades 3-5.

COURSE DESCRIPTION

Young learners answer the questions “What is the history of Unmanned Aviation?” and “How do they work?” Students learn how to program drone flight through coding in the Droneblocks application.

LESSON SEQUENCE AND LEARNING TARGETS

Lesson One: Introduction to Drones

- ☐ I can explain what a drone is, its functions, and how it flies.
- ☐ I can launch a basic field mission including coding the drone flight and executing the three basic motions of a drone.

Lesson Two: Drone Safety

- ☐ I can operate a drone safely.
- ☐ I can build tools to measure key factors for safe drone operation.

Lesson Three: What is Scratch?

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

Lesson Four: Loops, Loops, Loops

- ☐ I can compare the efficiency of sequences and loops in Scratch coding.
- ☐ I can fly a drone to simulate the task of searching for an object in an area.

Lesson Five: Using Operators

- ☐ I can simulate a real world flight by coding a flight pattern to scale.
- ☐ I can convert metric units for flight into imperial units.

Lesson Six: Angles and Operators

- ☐ I can use block coding to program a drone to yaw in precise angles.
- ☐ I can use block coding to fly a precise course.

Lesson Seven: Flying a Perimeter

- ☐ I can code a drone to follow the perimeter of a complex figure.
- ☐ I can define a real world area to be explored in abstract.

Lesson Eight: Delivery Abstraction

- ☐ I can create a variable change.
- ☐ I can program a flight plan for multiple deliveries.

Lesson Nine: Understanding Range

- ☐ I can test the range of the drone in 3 dimensions and record data about the effective range of the drone.
- ☐ I can plot, in abstraction a flight pattern, that takes range and battery into account.

Lesson Ten: What's Next

- ☐ I can consider the applications for drones used in the future.
- ☐ I can apply the mathematical understanding of physics to imagine future drone uses.

COURSE OVERVIEW AND PACING GUIDE

Lesson	Learning Targets	Materials Needed	Pacing (55-60 min.)
Introduction to Drones	<ul style="list-style-type: none"> ❑ I can explain what a drone is, its functions, and how it flies. ❑ I can launch a basic field mission including coding the drone flight and executing the three basic motions of a drone. 	<ul style="list-style-type: none"> - Classroom whiteboard and markers - “What is a Drone” Video (included in PPT) - Tablets with TelloEDU installed - Tello Drone 	<p>Engage: What is a Drone? (5 min.)</p> <p>Explore: Drone Exploration (15 min.)</p> <p>Explain: Drone and Drone Safety (10 min.)</p> <p>Elaborate: Flying Drone (20 min.)</p> <p>Evaluate: Learning Review (5 min.)</p>
Drone Safety	<ul style="list-style-type: none"> ❑ I can operate a drone safely. ❑ I can build tools to measure key factors for safe drone operation. 	<ul style="list-style-type: none"> - Classroom whiteboard and markers - Measuring tape or ruler/yardstick - 8.5 x 11 sheets of colored construction paper (4 per student) - Tissue paper (multiple sheets per student in a variety of colors) - Clear tape, glue stick, or stapler - Scissors 	<p>Engage: Introduction to Drone Safety, and Operation (10 min.)</p> <p>Explore: Deciding How to Use Drones (10 min.)</p> <p>Explain: Tools for Ensuring Safe Flight (15 min.)</p> <p>Elaborate: Building Tools for Safe Flight (20 min.)</p> <p>Evaluate: Learning Review (5 min.)</p>

What is Scratch?	<input type="checkbox"/> I can identify components of Scratch programming language. <input type="checkbox"/> I can construct and follow a set of sequential instructions.	- Drone Sequence Activity	Engage: Introduction to Scratch (10 min.) Explore: What is Coding (15 min.) Explain: Building Sequential Instructions (5 min.) Elaborate: Drone Sequence Activity (20 min.) Evaluate: Learning Review(5 min.)
Loops, Loops, Loops	<input type="checkbox"/> I can compare the efficiency of sequences and loops in Scratch coding. <input type="checkbox"/> I can fly a drone to simulate the task of searching for an object in an area.	- Tablets - Tello Drone	Engage: Sequences vs. Loops (10 min.) Explore: Building Loops (15 min.) Explain: Code Drone (15 min.) Elaborate: Execute Code (15 min.) Evaluate: Learning Review (5 min.)
Using Operators	<input type="checkbox"/> I can simulate a real world flight by coding a flight pattern to scale. <input type="checkbox"/> I can convert metric units for flight into imperial units.	- Classroom whiteboard and markers - Calculator	Engage: Flight Plan (5 min.) Explore: Creating a Map (15 min.) Explain: Determining Scale (10 min.) Elaborate: Plan the Code (25 min.) Evaluate: Learning Review (5 min.)
Angles and Operators	<input type="checkbox"/> I can use block coding to program a drone to yaw in precise angles. <input type="checkbox"/> I can use block	- Classroom whiteboard and markers	Engage: Understanding Precision (10 min.) Explore: Tools for Precision in TelloEDU (10 min)

	coding to fly a precise course.		Explain: Tools Using Yaw (10 min) Elaborate: Scenarios(25 min.) Evaluate: Learning Review (5 min.)
Flying a Perimeter	<input type="checkbox"/> I can code a drone to follow the perimeter of a complex figure. <input type="checkbox"/> I can define a real world area to be explored in abstract.	- Classroom whiteboard and markers	Engage: Why Does Perimeter Matter? (5 min.) Explore: Math of Perimeter (10 min.) Explain: Perimeter Abstractions (15 min.) Elaborate: Perimeter Coding (25 min.) Evaluate: Learning Review (5 min.)
Delivery Abstraction	<input type="checkbox"/> I can create a variable change. <input type="checkbox"/> I can program a flight plan for multiple deliveries.	- Tello Drone - Stopwatch	Engage: What is Work? (10 min.) Explore: Drone Delivery Process (10 min.) Explain: Variables in Coding (15 min.) Elaborate: Use Variable for Deliveries (20 min.) Evaluate: Learning Review (5 min.)
Understanding Range	<input type="checkbox"/> I can test the range of the drone in 3 dimensions and record data about the effective range of the drone. <input type="checkbox"/> I can plot, in abstraction a flight pattern, that takes range and battery into account.	- Tello Drone - Measuring Tape	Engage: Understanding the Signal (5 min.) Explore: Manual Test Flights (15 min.) Explain: Range Determination (10 min.) Elaborate: Flight Modifications (25 min.) Evaluate: Learning Review (5 min.)

What's Next	<input type="checkbox"/> I can consider the applications for drones used in the future. <input type="checkbox"/> I can apply the mathematical understanding of physics to imagine future drone uses.	- Tello Drone - Stopwatch	Engage: Drones Doing Work (5 min.) Explore: Math of Work Expanded (15 min.) Explain: Future Work (15 min) Elaborate: Considering Future Applications (20 min.) Evaluate: Learning Review (5 min.)
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COURSE PREPARATION

Students will be planning and flying missions with the Tello Drone. Make sure the drones are fully charged before each class period and that the TelloEDU app is loaded on tablets or other mobile devices.