Title:	Programming with an Emphasis in Drone Technology	Est. Start Date: 10/3/16	Duration: 3.5 - 4 weeks
Teacher:	Cathy Hofmann-Mook, Rebecca Currin	Grade Level: 6, 7	
Content Focus:	Engineering/Technology	Other subject areas to be included: Math, Language Arts, Science	

Overall Idea: Summary of the issue, challenge, investigation, scenario, or problem	Students will understand how coding is used in different technologies. Students will understand the benefits and concerns associated with drone technology. Students will also understand how block coding works to control different devices including drones.
The Project: What will students design, build, and/or present at the end of the PBL to demonstrate their expertise and solution/answer to the Driving Question?	Students complete exercises in block programming. Students will research the pros and cons of using drones and present this information to the class and compose an argument essay acknowledging and addressing counter-arguments. Students are challenged to code a drone to move from point A to point B. Students will need to overcome obstacles in the way. Students will design a coding lesson and present it to younger students.

Essential Question:	How can we use coding to complete an objective?	Driving Question:	How can we program a drone to move through an obstacle course?

Content and Skills Standards to be addressed: (CCCSS, NGSS, Calif.)	MS-ETS1.1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that many limit possible solutions. CCSS Math 6 RP 3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

CCSS Writing 6.1
Write arguments to support claims with clear reasons and relevant evidence.

CCSS.ELA-LITERACY.SL.6.4

Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.CCSS.ELA-LITERACY.SL.6.4
CCSS.ELA-LITERACY.SL.6.
Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 6 Language standards 1 and 3 for specific expectations.)

		T+A	E		T+A	E
21st Century Skills and MPS to be explicitly taught and assessed **(T+A)** or that will be encouraged **(E)** by Project work but not taught or assessed:	**Analytical Thinking**	x		**Make sense of problems & persevere in solving them.**		x
	Collaborating		x	**Reason abstractly & quantitatively.**		x
	Communicating	x		**Model with mathematics.**	x	
	Creating & Innovating		x	**Attend to precision.**	x	
	Finding & Evaluating Information	x		**Look for and make sense of structure.**		x
	Problem Solving	x		**Look for and express regularity in repeated reasoning.**		x

Presentation Audience				
Culminating Products and Performances	**Group:**	Students complete an obstacle course with their drones to demonstrate competence in coding. Working in pairs, students will design and teach a coding lesson to younger students.	**Class**	x
			School	x
			Community	
	Individual:	Argument essay	**Experts**	
			Web	

			Other:

Project Overview

| **Entry event** to launch inquiry, engage students:

Outline or Conceptual Flow Include assessment points and *clearly identify* opportunity(s) for students to inquire, research, and share their new knowledge with their peers.

Note: Details of lesson plans do not belong in the outline. | **Entry Event - Unplugged activity on Code.org: Graph Paper Programming**

Conceptual Flow
Big Idea: Coding is used in different types of technology.

I.   Coding
  A. Students are introduced to block programming using Code.org.
        1. Students complete Classic Maze exercises/activities on Code.org.
        2. Students will problem solve using block programming.
        3. Students learn programming concepts: loops, variables, functions, algorithms, and/or, conditionals, nesting, bug/debug, if then else, operator, coordinates.

  B. Students transfer coding skills using the Tickle app
        1.Students code robot to move back and forth
        2. *Assessment: Students code the robot to travel around the perimeter of a shape.

II. Students are introduced to another type of technology that can be coded -Drones. Students can explain what a drone is and what uses they have.
  A. Students will have a basic understanding of how a drone operates.
        1. Drones communicate through radio waves.
        2. Drones use GPS chips.
  B. Students will know how companies and businesses plan to use drones.
        1. Delivery, surveying, monitor crops, Amazon
  C. Students will know how average people use drones.
        1. Play, camera features
  D. Students will know pros and cons of drone technology through group research. They will also be able to provide examples of how drones may affect them during their lives.
        1. Pros include: military advantages include being able to put a drone where a human cannot go because it is too dangerous, less expensive than airplanes for surveillance, search and rescue, farmers are using drones to monitor crops, wildlife population monitoring, storm tracking, 3-D mapping, journalism, structural safety inspections,
        2. Cons include: privacy issues, interference with aircraft, drones are unstable, hostile enemy use, can be hacked,
        3. *Assessment: Student pairs will make a slide identifying one pro and one con of drone technology. Individually, students will complete a graphic organizer on which they identify 3 pros, 3 cons, and take a position for or against drone technology.
  E. Argument Essay
        1. Students will take a position regarding drone technology and write an argument essay defending that position. They must provide evidence for their position and provide examples based on their research. They must also acknowledge counter-arguments. |

F. Students apply their coding knowledge to program a drone to complete a mini obstacle course.
   1. Students must code using Tickle and run program.
   2. Students calculate the rate at which the drone is traveling in feet per seconds.
G. Students Teach a coding lesson to younger peers.
   1. Working in pairs, students will plan a coding activity to teach block coding to the younger students. They will use the Tickle app.
   2. Students will be expected to create their own learning objective for the lesson.

Assessments	Formative Assessments (During Project)	Quizzes/Tests	X		
		Journaling/Learning Log	X		
		Preliminary Plans/Outlines			
		Rough Drafts			
		Other			
	Summative Assessments (End of Project, identify content areas to be covered) *NOTE: The end of PBL Summative Assessments do NOT replace The Project.*	Written Product(s), with rubric	X	Other Products	
		Oral Presentation, with rubric	X	Peer Evaluation	X
		Multiple Choice/Short Answer Test		Self-Evaluation	
		Essay Test	X	Other	
Resources Needed	On-site people, facilities	Collaborate with teachers in younger grades			
	Equipment	Chromebooks, iPads, drones, Dash robot			
	Materials	Code.org paper lesson, Scholastic packets, paper and pencil			

	Community resources					
Reflection Methods	(Individual, Group, and/or Whole Class)	Journal/Learning Log		x	Focus Group	
		Whole-class Discussion		x	Fishbowl Discussion	
		Survey			Other	

Project Teaching and Learning Guide

Knowledge and Skills Needed by Students
(to successfully complete culminating projects and to do well on summative assessments)

Student needs to be able to: Understand basic block programming and explain block programming to peers and younger students.	**Student needs to be able to:** Communicate and collaborate effectively with peers and younger students to teach coding.
Student needs to be able to: Understand the expectations of an argument essay. Students need to be able to acknowledge and argue against counter-arguments.	**Student needs to be able to:**
Student needs to be able to:	**Student needs to be able to:**

Questions to be Provided by the Project Teacher
(to successfully complete culminating products and to do well on summative assessments)

Teacher asks questions to recall facts, make	**Teacher asks questions to summarize, analyze,**

observations, or demonstrate understanding:	organize, or evaluate:
What are some reasons your code worked/didn't work? Could you have programmed your code differently and it would still work?	What would be different in coding/design of the drone if there was a storm/high winds?
Teacher asks questions to apply or relate: What are the pros and cons of using drone technology?	**Teacher asks questions to predict, design, or create:** How can you design a coding lesson that will be understandable by younger students? What questions do you expect the students to have? How will you respond?

Teacher Reflection:
How did the unit flow? What worked well? What needs to be changed for next time? What did the students learn? What evidence do you have to support student's learning?

Weekly PBL Plans - Rebecca Currin and Cathy Hofmann-Mook   **Week #1**

Monday	Tuesday	Wednesday	Thursday	Friday
Entry Event: Drone Demo Coding Entry Level Activity - Code.org activity: Graph Paper Programming (Unplugged) https://code.org/curriculum/course2/1/Teacher **EL Strategies:** Frontload vocabulary needed for activity. Activity is hands-on and involves communicating with partner. **Intervention Lesson:** Struggling learners meet with teacher for small group instruction.	**Coding:** Introduce coding and Code.org Students learn the concepts of algorithm, loop, if then else. **EL Strategies:** Students watch videos to supplement definitions. Videos are available on the code.org site. **Intervention Lesson:** Students as teachers. Students with coding knowledge will be promoted to "Student Teachers" who can help struggling students.	**Coding:** Students continue coding activities on Code.org Students learn the concepts of functions, conditionals, operators, nesting, debugging. **EL Strategies:** EL Students will be paired with non-EL students. Teacher modeling **Intervention Lesson:** Students as teachers	**Coding:** Students transfer coding skills to the Tickle App. Students program the Dash and Dot robot to move back and forth. **EL Strategies:** Pictorial directions for Tickle will be provided to groups. **Intervention Lesson:** Students as teachers	**Coding Assessment** Students code their robots to move around the perimeter of a shape. Students explain what commands they used and why. **EL Strategies:** Review vocabulary ie. perimeter, degrees, angles. **Intervention Lesson:** Students watch coding videos to reinforce concepts.

Daily PBL Plans   Week #_____2_____   Dates _____

Monday	Tuesday	Wednesday	Thursday	Friday
-Students learn how drones operate Students learn the four forces of flight: lift, thrust, drag, gravity.	-How do businesses/industries want to use drones? (Amazon Air?) -How are drones being used? http://commoncore.scholastic.com/sites/default/files/Drones%20Take%20Off.pdf	Students read follow-up comprehension checks about drones; assign each student in groups of three Tracking Ivory, Clearing the Air, and Birds-Eye View. Each student reads one, then goes to meet with other students who read same article, then comes back to teach their original group about the article.	-Research, continued - Students start pro/con slides with partners -one slide per pair of students (only pro/con), but student notes on the effect of drone technology will be needed for an argument essay they will start in the next couple of sessions	**Assessment**: *Students present their Google slides to the class (groups). *What's Your Opinion worksheet from Scholastic. Students must identify three pros and three cons and take a position on drones (individual).
EL Strategies: -pictures accompanying vocabulary **Intervention Lesson:** Small group to review forces of flight and drone parts.	**EL Strategies:** Create sentence frames and provide a word bank with new vocabulary to facilitate discussion.. **Intervention Lesson:** Comprehension checks of reading.	-Students start research about pros/cons of drone technology and how drone technology will/may affect them over the course of their life **EL Strategies:** EL students are partnered with non EL students. Students have the opportunity to meet with other students who read the same section before they	**EL Strategies:** Teacher modeling examples of slides. **Intervention Lesson:** Teacher will meet with groups to discuss progress.	**EL Strategies:** Students are provided with sentence frames for answering questions. **Intervention Lesson:** Students partner to discuss the pros/cons of drone technology before writing.

		have to present it to their group. **Intervention Lesson:** Whole group review and discussion of how drones are being used in the real world.		

Daily PBL Plans   Week #____3_____   Dates _____

Monday	Tuesday	Wednesday	Thursday	Friday
Students research how drone technology and coding will affect them in the future for a writing assignment. Teacher will review expectations for argument writing. **Assessment**: Students will begin writing an argument essay taking a stance for or against drone technology and describe how drone technology and coding will affect them in the future. **EL Strategies:** Students are provided with sentence starters for their essay. Students are provided with a graphic	Students continue research and argument essay about drones. **EL Strategies:** Students are provided sentence starters for their essay. Students are provided with a graphic organizer to start writing essay. **Intervention Lesson:** Teacher will meet with struggling students to help guide research and writing process.	Students finish argument essay about drone technology. **EL Strategies:** Students are provided sentence starters for their essay. Students are provided with a graphic organizer to start writing essay. **Intervention Lesson:** Teacher will meet with struggling students to help guide research and writing process.	Students are reintroduced to the classroom drone. Teacher shows how to control the drone using the Tickle app. Students practice lift off and landing. Teacher demonstrates measurements in the Tickle App. https://tickleapp.com/hour-of-code/parrot_drone/ **EL Strategies:** Teacher uses to TPR strategies to teach lift off and landing. **Intervention Lesson:** Teacher will monitor student engagement and help students	Students experiment with the power in the tickle app and discuss the relationship between speed, time and distance. Students calculate the rate of speed from timing the drone over a certain distance. Students are challenged to code the drone to fly in a square, and triangle. Students will learn the angles needed for each shape. Students learn how to add a loop block to repeat motions. **EL Strategies:** Tickle site has pictures with explicit directions. Students will also be paired with English proficient student.

organizer to start writing essay. **Intervention Lesson:** Whole class lesson about outline/expectations for essay along with rubric.			individually while coding.	**Intervention Lesson:** Teacher will monitor student engagement and help students

Daily PBL Plans   Week #____4_____   Dates _____

Monday	Tuesday	Wednesday	Thursday	Friday
Students will program their drone to complete an obstacle course. Younger students from other classes will be invited to watch the obstacle course demonstration. **EL Strategies:** Hands on activity **Intervention Lesson:** Teacher will monitor student progress and assist students.	Working in pairs, students will plan a coding activity to teach block coding to the younger students. They will use the Tickle app. Students will be expected to create their own learning objective for the lesson. **EL Strategies:** EL students will be partnered with proficient students. **Intervention Lesson:** Teacher will monitor student progress and assist students.	**Assessment**: Students will present their lessons to small groups of younger students in other classrooms. Students will assess the presentations of other groups. One group will present while the other assesses, and then they will switch. **EL Strategies:** EL students are paired with proficient English students. They will also be partnered with younger EL students. **Intervention Lesson:** Teacher will monitor the peer assessment process.		

Daily PBL Plans   **Week #_____**   **Dates _____**

Monday	Tuesday	Wednesday	Thursday	Friday
EL Strategies:	**EL Strategies:**	**EL Strategies:**	**EL Strategies:**	**EL Strategies:**
Intervention Lesson:	**Intervention Lesson:**	**Intervention Lesson:**	**Intervention Lesson:**	**Intervention Lesson:**