**Cover Page**

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| Lesson Title | Drone Discovery Simulation |
| Context Key Words | Drone, crop, programming, engineering design |
| Grade Level | 6-12 |
| Next Generation Science Standards | HS-PS4-5 Communicate technical information about how technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.\*   |  |  | | --- | --- | | HS-ETS1-2. | Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. |   HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.\* |
| Math Practices | * Reason abstractly and quantitatively * Model with Mathmatics |
| Supplies Needed | * Computer lab with access to Scratch website |
| Lesson Outline | * What are drones for? Elicit some practical suggestions, especially focusing on information-gathering abilities. * Optional: Here is a slide show that summarizes much information about drones. Agricultural applications are found near the end: http://www.slideshare.net/Funk98/drones-and-their-increasing-number-of-applications * Whole class discussion of drone information-gathering abilities. Be sure to bring out that drones may be equipped with sensors (such as IR or UV) that give information beyond what the visible-spectrum camera provides. Also, mention that certain alterations in normal plant development leave observable traces. Ex. A white fungus growing on a plant could suppress or enhance its IR signature. * Announce that students will be programming a drone to help in the agricultural setting – looking for infected crops within a large field. * Provide students with the handout “Instructions for Using Drone Discovery”, and direct them to the website listed there; or search scratch.mit.edu for “4h” to find it. * Troubleshoot with students as they learn to manipulate the programming “bricks” within the scratch program, and observe the effects of their programming changes on the drone’s flight and detection of infected crops. * Next, issue the challenge for students, listed at the bottom of the handout. Be sure students understand all of the criteria and constraints on a successful mission, and how the winning project will be determined. * As students finish, make a classroom tally of total infected crops detected by all successful groups. * Before the class ends, have students write a reflection on their strategies, challenges, and results while taking on the challenge. |
| Time Needed | 60 minutes |

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| **Activity Context**  This activity can occur at any time during the school year. Ideally, it is situated within a unit of instruction concerning human impacts on the environment, technologies being developed to meet the challenges of feeding a growing population, or on the electromagnetic spectrum. |

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| **Student Directions**  See the ancillary student handout “Instructions for Using Drone Discovery”. Be sure to leave enough time for the writing reflection. | | | |
| **Activity** | **Teaching Approach** | | **Estimated Time** |
| Compare Percentages and Fraction Areas |  | |  |
| Teacher Guidance/Questioning | | Anticipated Student Responses/Misconceptions | |
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| **Revisiting Context** | | | |
| **Activity** | **Teaching Approach** | | **Estimated Time** |
| Coverage of a street by security cameras |  | |  |
| Teacher Guidance/Questioning | | Anticipated Student Responses/Misconceptions | |
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The content of this lesson was derived from *Optimizing Coverage: Security Cameras Formative Assessment Lesson* from the Mathematics Assessment Resource Service (<http://map.mathshell.org>). It is modified here under the requirements of the Creative Commons license.