

Invent-A-Drone Lesson Plan (Teacher Guide)

Overview:

In this lesson, students will work in small groups to brainstorm an idea for a drone that will solve a problem, build that drone out of crafts materials, and then present their drone to the class. This lesson plan was designed for students in grades 6-8 but can be used/modified by teachers to be used for other age groups.

Required Materials/Resources:

- Student packets for the students and the teacher version of the packet for the instructor (included at the end of this document)
 - Student Packet in [English](#)
 - Student Packet en [español](#)
- Arts and crafts supplies to make drones (the list below includes some ideas, but any art supplies that are available can be used for the lesson):
 - Construction paper
 - Tape
 - Pipe cleaners
 - Aluminum foil
 - Markers/crayons/colored pencils
 - Popsicle sticks
 - Recycled materials (cardboard, containers, cleaned bottle caps, etc.)

Learning Environment Needs:

- Setup where students are able to work together in groups (ex. Chairs set up around a table)
- Have the classroom set up so that when students first enter the classroom, they can sit in the groups that they will be working in

Pre-Work: N/A

Time to Complete Lesson: Around 1 to 1.5 hours

Lesson Plan Outline:

Part 1. Introduction (5-10 minutes)

Part 2. Brainstorming problems (5-10 minutes)

Part 3. Sketching out drone design (5-10 minutes)

Part 4. Constructing drones using art supplies (20-30 minutes)

Part 5. Presentations (2-5 minutes per group)

Standards Addressed by this Curriculum:

Oregon Engineering Technology Cluster Skills

EN01.01.01 Use effective methods to communicate essential engineering concepts to diverse audiences.

EN01.01.04 Apply active listening skills using reflection, restatement, questioning, and clarification for engineering topics.

EN01.01.05 Effectively communicate engineering related scientific, technological, engineering, or mathematical information to the intended audience.

EN01.01.08 Use interpersonal and group dynamic skills effectively.

EN06.01.01 Use teamwork skills to achieve goals, solve problems, and manage conflict.

EN06.01.02 Work effectively in the engineering workplace with others from diverse backgrounds.

EN06.01.04 Exercise the ability to lead or follow in an engineering team environment.

EN06.01.05 Act responsibly as a team member, completing assigned tasks in a timely and effective manner.

EN06.01.06 Employ critical thinking skills of analyzing, synthesizing, and evaluating to solve problems and make decisions.

EN06.01.07 Solve problems using creativity and innovation.

EN08.01.01 Understand and apply the engineering design process to create a product, system or process.

EN08.01.02 Apply creativity techniques during the design process.

EN09.01.01 Understand the role creativity plays in the design process.

EN09.01.02 Understand methods used to increase creative thinking.

EN09.01.03 Understand the how visualizing a product, a concept, a process, or a system contributes to the work of engineers.

EN09.01.04 Exhibit the ability to be creative.

EN09.01.05 Exhibit the ability to think abstractly.

Oregon Visual Arts Standards (8th grade)

8.2.1. Experiment, innovate, and take risks to pursue ideas, forms, and meanings that emerge in the process of art making or designing with attention to quality craftsmanship and organizational structures (i.e. elements and principles of design, composition).

8.3.2. Analyze and reflect on how the elements and principles of design and other experimental approaches are working to convey the artistic intention and make necessary adjustments for the most effective solution.

8.3.4. Document and explain important information about one's artwork and artistic process verbally and in writing.

8.5.1. Individually or collaboratively plan, prepare, and present selected artworks for display and include informational materials for the viewer

8.5.3. Write an artist statement that includes artistic intention, processes, and specialized language.

Build A Drone Workshop (Teacher Version of Packet)

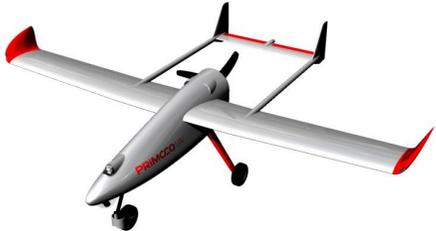
Table of Contents (matches student table of contents):

Page	Content
1	Introduction
1	What are drones good for? What technologies do they use?
3	What is a problem that you would like to solve using a drone?
4	What would this drone look like?
5	Creating Your Drone
6	Reflection / Evaluation

Introduction

Introduce students to the main types of drones, and also explain how drones are being used to solve many problems. Let students know that they will be working in groups to create a drone that will solve a problem as a part of the workshop. This should take 5-10 minutes.

There are many different kinds of drones that exist. Here are some of the main kinds of drones:

<p>Single-rotor: has one rotor/propeller (like a helicopter)</p> 	<p>Multi-rotor: has more than two rotors/propeller</p> 
<p>Fixed-wing: has one wing fixed in place (like an airplane) and has no rotors/propellers</p>  <p>"Primoco UAV" by Semetkovsky, used under CC BY-SA 4.0 <https://creativecommons.org/licenses/by-sa/4.0>, via Wikimedia Commons</p>	<p>Fixed-wing hybrid: has both a wing fixed in place plus rotors/propellers</p>  <p>"Wingcopter Drone" by Akash 1997, used under CC BY-SA 4.0 <https://creativecommons.org/licenses/by-sa/4.0>, via Wikimedia Commons</p>

What are drones good for? What technologies do they use?

Drones are great for carrying out many different kinds of tasks, especially ones that fit into any of the **3 D's: dangerous, dirty, or dull**.

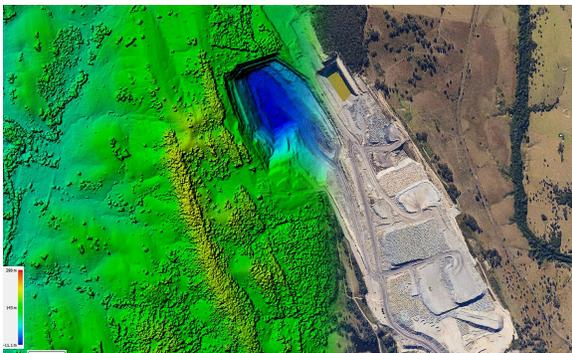
Drones are good for doing **dangerous** tasks. Examples include taking video footage of volcanoes for science, observing the site of a fire before sending firefighters in, or monitoring weather conditions like tornados or hurricanes.

Drones are also good for doing tasks that can be **dirty**. Some examples are collecting whale mucus for scientists or helping farmers to spread pesticides or fertilizers over their fields.

Finally, drones are also helpful for doing **dull** or boring tasks. Examples of these include drone package delivery and taking photos of farm fields to evaluate the health of plants.

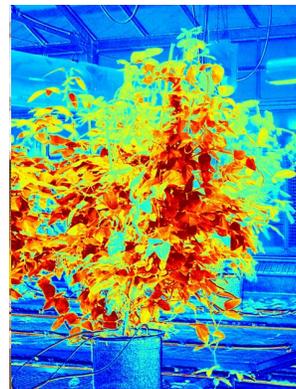
To carry out tasks, drones utilize different technologies to collect information about their surroundings. Many drones have cameras to take videos or photos of places that they are flying. Many drones also have sensors to help them take measurements that help them do their jobs. There are sensors for just about every purpose (ex. temperature sensors, pollen sensors, infrared sensors, etc.). Shown below are some examples of sensors used by drones and how they help them do their jobs:

LiDAR (Light Detection and Ranging): This technology uses lasers to survey lands and measure the elevation of land in different places.



"Stockpile Aerial Photo" by Aerutopian, used under CC BY-SA 4.0 <<https://creativecommons.org/licenses/by-sa/4.0/>>, via Wikimedia Commons

NDVI (Normalized Difference Vegetation Index): This technology captures photos of farm land and to evaluate the health of the plants and crops.



"Soybean NDVI Photo" by K-State Research and Extension, used under CC BY 2.0 <<https://www.flickr.com/photos/ksrecom/8467659757/>>, via Flickr

Photogrammetry: Photogrammetry is similar to LiDAR, except it collects details of the land that it is surveying to create a detailed image.



3D London aerial photogrammetry city model © 2021 AccuCities®

GPS (Global Positioning System): GPS is a satellite system that provides data about location and navigation. This is helpful for drones to know where they are, which is data that can be sent to the person who is using the drone (similar to Google Maps).

"Photogrammetry 3D city model of London" by AccuCities, used under CC BY-SA 4.0 <<https://creativecommons.org/licenses/by-sa/4.0>>, via Wikimedia Commons



Screenshot from Google Maps

What is a problem that you would like to solve using a drone?

Use the space below to brainstorm any problems that you would like to solve using a drone. Feel free to write, draw photos, or make a list. **List any problems that you come up with, no matter how big or small they are. It can be anything from a worldwide problem that affects many people (ex. Solving global warming) to a problem that affects you personally (ex. Cleaning your room).**

Have students start out by individually brainstorming problems that they would want to solve using a drone. Encourage students to write down any problems that they come up with, no matter how small or big the problem might be!!! It can be anything from a personal problem (ex. Cleaning a room, making a bed, walking a dog, etc.) to a big problem (ex. Cleaning up ocean pollution, helping with climate change, etc.). This should take 2-5 minutes.

Now that you've come up with some ideas, share some of them with your group. As a group, decide on one problem that you would like to solve by building a drone. Write down the problem that you will be solving together in the spot below:

Next, have students share their ideas with their group mates so that, together, they can pick a problem that they would like to build a drone to solve. This should take 2-5 minutes.

What would this drone look like?

It's time to design a drone to solve your group's chosen problem. Work together to sketch out a plan for what the drone will look like. What type of drone is it (single-rotor, multi-rotor, fixed-wing, fixed-wing hybrid)? How big or small is it? What does the drone do to solve the problem? What tools or equipment does the drone have to solve the problem? **Be sure to label the different parts of the drone in your picture to describe what each part does.** You will be constructing a prototype of this drone using different materials.

Have students spend some time working with their group to sketch out a design for the drone that they are going to build. Encourage students to add labels to their pictures to describe the different parts of their drone and what those parts do to help solve their problem. It could be helpful to have the art supplies available nearby for students to see/touch to think what supplies they would like to use to construct the different parts of the drone. This should take about 5-10 minutes.

Afterwards, have students work with their groups to build the drone based on the sketches they made. This can take around 20-30 minutes, but this time can be adjusted to be less or more depending on how much time is available for the workshop.

Creating Your Drone

Work together with your group to create your drone out of the provided supplies. **As a team, come up with a name for your drone and write it here:**

After students have finished creating their drones, give them a few minutes to name their drone and to revisit the problem that they designed their drone to solve. After giving students time to prepare, have each group present their drone to the class and talk about the problem their drone was trying to solve and how the different parts of the drone help to solve the problem. This should take around 2-5 minutes per group.

After constructing your drone, prepare to present your drone to the class. Be sure to talk about:

- What the name of your drone is
- What problem your drone is trying to solve
- The different parts of the drone and what they do to help solve the problem

Use the space below to write out what you are going to present:

Reflection / Evaluation

After receiving feedback when sharing your drone with the class, is there anything that you think you would have wanted to add or change to your drone design?

After students have shared their drones with the class, have them spend some time reflecting on design improvements they would have wanted to make if they had more time or based on the feedback they received on their drones.