Object-Oriented Fun

Overview
CS Hands-On is a 501(c)(3) nonprofit teaching computational thinking skills through technology-free lessons and activities. This curriculum is built to teach fundamental computer science concepts in an engaging, hands-on way. In this mission, students use object-oriented programming to play a card game.

Prerequisite Knowledge
Students should have completed the Conditional Schedule activity, which introduces the concept of if-then statements.

Lesson Details
At Decomposphere, students will learn to break problems down into smaller parts with Dot. Students will learn the fundamentals behind object-oriented programming using variables, functions, and classes. Then, students will play a Mystical Elements card game, where each card represents a card object with its own traits and attributes.

This lesson was developed for students ages 8 to 13, and can be modified for students of all skills and ages. This lesson takes around 30 minutes.

Learning Objectives

Key Question
How can we use object-oriented programming to create different objects?

Key Terms
Object-oriented programming: A programming model used to break down objects into their own unique variables and functions

Curriculum Standards
Students should be able to...
- Explain how object-oriented programming is used (Decomposition)
- Read, write, and interpret objects (Literacy)
- Use object-oriented programming to play a card game (Creative Arts)

View standards addressed here
Lesson Plan

Materials

- Object-Oriented Fun worksheet (per student)

Setup

- Hand out an Object-Oriented Fun worksheet to each student
- Set up your classroom to form students in groups of 2

Drivin' Around Decomposphere

Welcome back to the scenic landscape of Decomposphere! Get ready to follow Dot around in his Dot-mobile to learn about object-oriented programming.

Vroom Vroom...

We can use object-oriented programming to model objects using variables and functions. We can represent just about anything using variables and functions, from cars to dogs to houses!

In Decomposphere, Dot and his friends love driving around town and catching the summer breeze. Let’s take a deeper look at object-oriented programming through Dot’s car: the Dot-mobile!

More cars!

On the right, we can see that the Dot-mobile, minivan, and taxi are all different types of cars.

Looking at the complete picture, Dot-mobile belongs to a large group of cars. Since all of these cars share similar features, we can create specific types of vehicles like the

Reflect

Using our Dot-mobile object, how can we change the properties to create our own Dot-mobile? We can change the object’s variables (color, seats, owner) and functions (start, stop) to create our own personalized Dot-mobile.
We call the car our parent object because it passes down shared variables and functions to its child objects.

Let’s take a closer look at the parent object:

Since all cars have a specific color, number of seats, owner, and can start and stop, every child car (the Dot-mobile, Minivan, and Taxi) shares the same structure as the parent car.

Why is Object-Oriented Programming useful?

Programs often have lots of code, which can become messy and complicated. When we have similar objects that share similar qualities but are not exactly the same, we can use inheritance (the passing down of features) in object-oriented programming to take the features of a parent object and apply them to its child objects. This template saves us time when creating child objects.

Referencing back to our car example, we can use our parent car object to create other cars like limousines or electric cars!

Educator’s Note

Object-oriented programming can be used to describe many different scenarios and objects. Encourage your students to brainstorm different objects that this thinking can be applied to.

Reflect

Can you think of other variables and functions that a car would pass down to its child objects? Ex. Variables: Number of windows, price, brand
Functions: Honk, wiping windows, turning on headlights
Let's Review Functions!

A function includes actions used to complete a task. Here's a quick refresher on how we can create our own functions:

- Write the steps necessary to accomplish our function
- Include a descriptive title
- Press the button at the middle of the steering wheel
- Honk a Car Horn
Mystical Elements: The Game
Use your knowledge of object-oriented programming to play a fun game of Mystical Elements with a friend! The first six cards each represent an object (a character from our six planets) with its unique variables and functions on your Card sheet. Each function is a superpower that relates to water, snow, or fire.

Setup
- Customize three different child objects on your Card sheet from the parent Card object. Assign your child objects variables (name and home) and a superpower function!

How to Play
- From your nine cards, pick one card to play and place it face down.
- Once both of you have placed your cards down, flip them face up and compare your object’s element variable to decide the winner! Water puts out fire, fire melts snow, and snow freezes water.
- The player who wins the round takes both cards.
- The player with the most cards wins!

**Mystical Elements Cards**

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>VARIABLES</th>
<th>VARIABLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name = Dot</td>
<td>Name = Ellis</td>
<td>Name = Lex</td>
</tr>
<tr>
<td>Home = Decomosphere</td>
<td>Home = Evaluatus</td>
<td>Home = Logicaland</td>
</tr>
<tr>
<td>Element = Water</td>
<td>Element = Water</td>
<td>Element = Snow</td>
</tr>
<tr>
<td>FUNCTION</td>
<td>Whopping Waves</td>
<td>Icey Attack</td>
</tr>
<tr>
<td>Water Spiral</td>
<td>Destroys fire with a tide of waves</td>
<td>Freezes water into large ice crystals</td>
</tr>
</tbody>
</table>

**Ex. Water beats fire**

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