**Lesson 9** Adding Images in p5

**How do we add images to a p5 sketch without HTML?**

| **Overview** | |
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| In this lesson, students learn how to identify properties of images they find online. They will use new functions to load and display images in p5. | |
| **Lesson Objectives** | |
| Students will be able to   * Identify image properties (file type, dimensions, and size) * Load images into p5 from local files * Control image position and size on the p5 canvas | |
| **Suggested Duration** | |
| One period (45 minutes) | |
| **Blueprint Foundations Student Outcomes (**https://blueprint.cs4all.nyc/outcomes/) | |
| Algorithms  Analyze | **Explain** why I used specific instructions to complete a task. |
| Programming Analyze | **Experiment** with the commands of a programming language. |
| Programming  Prototype | **Explain** why I chose specific commands to communicate my instructions. |
| **Vocabulary** | |
| * **File type/extension**:The extension after a file determines how a computer interprets the data in the file. Different **image** file types are able to store different kinds of images. For example, a **.gif** file type can store animated GIFs. A **.png** file type can store images with a transparent background.Other common image file types are .jpeg, .tiff, and .svg | |
| **Planning Notes** | |
| * Some students may want to spend an entire period searching for images. Make it clear that images must end up on the canvas for their work to count! | |
| **Resources** | |
| * [Coding Train - Uploading Media Files](https://www.youtube.com/watch?v=rO6M5hj0V-o) | |
| **Assessments** | |
| * Assess the Student Activity. Check for the ability to:   + Find and download images to their devices   + Identify image properties   + Add and display images in p5   + Adjust position and size of images in p5 | |

| **Do Now:** |
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| Students should follow these prompts:   1. Think about words that describe how you’re feeling today--happy, jumpy, tired, amazing, meh, grumpy, etc. 2. Go to [images.google.com](https://images.google.com/) 3. Using the words you came up with, **search for 3 images** that represent your mood |
| **Discussion: Finding and Downloading Image Files** |
| * In this lesson, students will learn to draw images directly on the canvas without using HTML. Among other applications, this will allow students to use images in their button games at the end of the unit. * Tell students to pull up one of the images they found in the **Do Now**. You will walk them through how to download this image locally and rename it before loading it into their p5 projects:  1. Search for an image on images.google.com    1. You can use “Tools” to narrow your search by searching for images of a certain size, color or transparency, or GIFs.      1. Find the image you want to use, and then **click once** so that it comes up on the right side of the web browser. 2. **Right click** on the image (or click with two fingers if using a trackpad) and select “Save image as...” 3. Rename the image to something simple and descriptive and hit “Save”  * Explain to your students that they have now saved their file **locally** to their computers. Model how to find this image in the downloads folder, and show display its properties (this will vary depending on the device and operating system) * The image properties students should be able to identify are:   + **File type** (for example: .jpeg, .png, .gif): Students should double-check that the file is actually an image based on the extension.   + **Dimensions**: Students should note the original width and height of the images. Images that are larger than 400 by 400 will not complete fit on a default canvas. The dimensions can be adjusted in p5, but will distort the image if a different proportion is used.   + **Size**: File “size” doesn’t refer to its width and height, but how much memory it takes up on a computer. In order to load an image onto p5, the file size must be less than 5 MegaBytes. * Independent Exercise: Students should take 5 minutes to download and rename the other images they found in the **Do Now**. |
| **Teacher Demo: Loading and Displaying Images in p5** |
| Code Along: Adding Files   * Now that students have downloaded some images, walk them through the process of loading these images in p5.  1. **Show Sketch Files**: Click on the small gray arrow under the “Play” button to reveal the area where all of the sketch files are located.      1. **Add File**: Click on “Sketch” in the menu bar and select “Add file” from the dropdown menu.      1. **Click to Upload**: Click on the white box to display the files on your computer (or drag and drop). You may need to navigate to the **Downloads** folder to find the images you want to use. Double click the image you want to upload. **Do not type** the file name into the box or click “Add File”⁠—this is used to create blank text files.  Click on the “X” in the upper right to close out after the bar is gray and the file name appears with your other sketch files.     Code Along: Loading and Displaying Images   * Build out [the following sketch](http://editor.p5js.org/mparker/sketches/Is2hZ-siC) for students. Explain that students will need to use variables to store actual images (as opposed to numbers), and call three new functions:   + **preload()**: Makes sure files are loaded and ready to be used before the program runs   + **loadImage(“fileName”)**: Loads the file into the program   + **image(variableName, x, y, [width], [height])**: Displays the image file on the canvas. * The file name used in **loadImage()** will change depending on how students named their files. It must be in quotes and exactly match the name as it appears in the Sketch Files folder (including extension). * The width and height parameters for the **image()** function are optional, but depending on the image’s original dimensions it may not fit on the canvas. Students should keep dimensions **proportional** by dividing or multiplying by the same number when changing width and height. * If students are struggling to add their images to the Sketch Files folder, they can use [this sketch](https://editor.p5js.org/mparker/sketches/4C7zkJHkU) to follow along.     Citations:   * Though images found online can be difficult to cite, students should include some sort of citation, even something as simple as “Source: [link to image]”. Remind students that as they’re putting their wonderful ideas into the world, they need to give credit when they use other people’s work! * Here is one way to cite the example from the code along:      * You are welcome to use MLA or APA citations in CS Class, especially if your students are already using these formats in other classes. |
| **Student Activity: Mood Board** |
| * Using the images or gifs from the **Do Now**, students should create a “Mood Board” in p5:   + All of the images should be visible on the canvas (the images and/or canvas may need to be resized)   + All of the image sources should be cited at the top of the sketch as comments * Some suggestions for early finishers:   + Search specifically for transparent images and experiment with layering   + Add gifs! The process is similar, but will require using the **createimg()** function and different syntax. [This sketch](https://editor.p5js.org/mparker/sketches/zjjnv1vFS) can be used for reference. |
| **Wrap Up** |
| * Have students share their mood boards with you along with a couple of sentences about how they’re feeling today/this time of the year. Use this as an opportunity to check in with your students and make them feel supported. |
| **Extension: Controlling Images with Key Presses** |
| Extension 1: Moving a Game Sprite     * In this extension, students will move a “sprite” (two-dimensional character used in games) around the canvas using key presses, one of the basic mechanics in many video games. The instructions are below. * Note: If students are using devices with webcams, you may choose to let them take a picture of themselves to use as a sprite.  1. Find an image of a character to use as a game sprite. 2. Add the image to p5 and load it into the sketch using **preload()** and **loadImage()**. 3. Create three variables: one to store the image itself, and two more for the image’s x and y positions. 4. Use **conditionals** inside the **keyPressed()** function to check if [keyCode](https://p5js.org/reference/#/p5/keyCode) is equal to LEFT\_ARROW, RIGHT\_ARROW, UP\_ARROW, and DOWN\_ARROW. 5. Depending on which arrow key is pressed, the x or y variables should increase (**+=**) or decrease (**-=**)  * Example solution can be found [here](https://editor.p5js.org/mparker/sketches/WTp4bs66_). * keyPressed() vs. keyIsDown()   + In this activity, students may notice that the sprite only moves **once** when a key is pressed. To show students how to **continuously** move the sprite by holding down arrow keys, you can introduce them to the [keyIsDown()](https://p5js.org/reference/#/p5/keyIsDown) function, as with [this example](https://editor.p5js.org/mparker/sketches/G2M0vAcIK).   Extension 2: Toggle the Head Tilt   * In this extension, students will use arrow keys to toggle between two images, tilting a dog’s head left and right. This is an advanced activity which introduces the concept of **saving a variable inside a different variable**, illustrated in the code snippet below:      * Begin the activity by showing students this gif:      * Build out [this example](https://editor.p5js.org/mparker/sketches/hQguwNyKE) with help from students, which uses these two frames (individual images) from the gif above:      * Introduce the new variable-in-a-variable concept on Line 14, using it to change the background on Line 19. Students should finish the sketch by working in pairs to write a conditional that toggles the images when the left and right arrow keys are pressed. * [Solution](https://editor.p5js.org/mparker/sketches/6PSNL3Zc9) for teacher reference |