### **Images**

### **Duration: 1 Week**

### **Summary**

This lesson introduces the second computational artifacts: those that are images. It does so by introducing the Pixlr editor, a free cloud-based tool that is similar to the basics of Photoshop. It also describes image metadata. The first video summarizes concepts from the Binary Data lesson that described how images are represented and then goes into a bit more detail on color representation in digital images.

The reading and second video lecture are essentially tutorials on using Pixlr for image processing. They show the basic concepts in Pixlr such as layers, the tool pallet, and filters (which are very similar to those in Photoshop, GIMP, and other image processing applications).

The assignment has students create an image in .bmp and .jpg formats. It then has the students examine properties of these formats including: files size, metadata, and file signatures using a hex editor to see the bytes of the files. The assignment also has the student create images for use in their Computing Impacts project such as a logo, a web page banner, a web page background, and an animation that are artifacts that they can put into a web page, such as the Google Site that they make in the Internet lesson.

### **Learning Objectives**

* Create a computational artifact for creative expression. [AP CSP P2, LO 1.2.1]
* Create a computational artifact using tools and techniques to solve a problem. [AP CSP P2, LO 1.2.2]
* Create a new computational artifact by combining or modifying existing artifacts. [AP CSP P2, LO 1.2.3]
* Use Pixlr to combine and modify existing images including:
  + Crop images
  + Resize images
  + Rotate images
  + Combine images using layers
  + Use layers to add features to images
  + Make images with transparent backgrounds
  + Add text to images
* Use computing tools and techniques for creative expression. [AP CSP P2, LO 1.3.1]
* Analyze the correctness, usability, functionality, suitability of computational artifacts. [AP CSP P4, LO 1.2.5]
* Describe how images are represented using binary data (covered in Binary Data module, reiterated in this module).

### **Course Material**

* Watch: [Pixels and Images](https://www.youtube.com/watch?v=15aqFQQVBWU&list=PLzdnOPI1iJNfV5ljCxR8BZWJRT_m_6CpB&index=1) [5:49]
* Read: [Computing As A Creative Activity and Computational Artifacts](http://computing-concepts.cs.uri.edu/index.php/Computing_As_A_Creative_Activity_and_Computational_Artifacts)
* Read: [Blown To Bits - Chapter 3 (Ghosts in the Machine)](http://www.bitsbook.com/wp-content/uploads/2008/12/chapter3.pdf)
* Read: [How to use Pixlr](http://www.wikihow.com/Use-the-Pixlr-Online-Image-Editor)
* Watch: [Pixlr Tutorial](https://www.youtube.com/watch?v=A_XDQSG1wsA) [1:21:00 hour]
* Watch: [Image File Formats](https://www.youtube.com/watch?v=5AhEqQw8fHQ) [9:13]
* Read: [Exif Image Metadata](http://en.wikipedia.org/wiki/Exchangeable_image_file_format)

### **In Class**

* Optional: [Image Representation Unplugged](http://csunplugged.org/image-representation/)

### **Assessments**

* Conceptual Quiz:
  + [Images/Pixlr](https://docs.google.com/document/d/1gCObzqGSsPLWytxBlXggVd9zGEDQlxyasWgLk00gUw4/edit?usp=sharing) (requires access)
* Practical Assignment:
  + [Image Manipulation in Pixlr](https://drive.google.com/open?id=1mOZn9Bd6SKavjc1rT5EcITfJCriLsKlEx6JAW-HnyH0) | [Grading Rubric](https://drive.google.com/open?id=1sRcQx4CaxzSMeOkvsJaVDCqVhQs40qbBO-ULifFARa8) | [Answer Key](https://docs.google.com/document/d/1zNcszCo8NLiVMVowPc4wQRrjzQzxlF6GpWOETbvP-3A/edit?usp=sharing)
  + [BB Ch 3: Ghosts in the Machine](https://drive.google.com/open?id=1X8rvlv2Gg1XFhUk9DPPN59IH69F2IWwA6ndmdUkXZus)