



The ICT4me Curriculum

About ICT4me

ICT4me is an after school and summer curriculum for middle school youth to develop ICT fluency, interest in mathematics, and knowledge of information, communication, and technology (ICT) careers. This problem-based curriculum capitalizes on youth interest in design and communication technologies. ICT4me provides structured interactions with ICT professionals, including having youth participate in engineering design and development teams. ICT4me's promotes a train-the-trainer approach to building capacity in informal ICT learning.

Build IT vs. ICT4me

ICT4me is a derivative of the Build IT curriculum co-developed between SRI International and Girls Inc. of Alameda County. Questions about the Girls Inc. implementation of Build IT can be directed to them at <http://www.girlsinc-alameda.org/about/contact>.

SRI is no longer supporting the development of ICT4me, so the curriculum materials are offered as is.

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This material is based upon work supported by the National Science Foundation under Grant Nos. 1339181, 1232461, and 0524762. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Electronic Versions of Materials

Electronic versions of all materials in this unit are available for download from the website at <http://ict4me.sri.com/>.

Contact Information

Please contact the SRI International Inquiry line for questions about ICT4me.
<https://www.sri.com/contact/form>

Week 6: Sizing Your Image

Summary

Schedule

Warm-Up	Search for images on Google	5 min
Challenge	Measuring file sizes for different compression settings	25 min
Main Activity	Making the right image for any situation	30 min
Discussion/Reflection	Lessons learned about image size	10 min
Total Time		1 hr 10 min

Essential Questions

- How can you divide tasks among team members in order to develop an effective product?
- How can you best present your work to your client?

Design Process Concepts Involved

- Research it.



Glossary:

- **Image size.** There are several ways that people use the term “image size.” It can refer to file size (i.e., number of bytes it will take to store the file), the number of pixels in a bitmapped image (e.g., 400 x 320), or it can refer to the display size of a particular output, say on paper or on the screen. The number of pixels and the color depth of an image are used to calculate the file size.
- **File size.** The number of bytes of the file, used to determine how much space is necessary to store or send the file.
- **Resolution.** The sharpness and clarity of an image. Screen resolution refers to the number of dots (pixels) on the screen. For example, a 640-by-480 pixel screen is capable

of displaying 640 distinct dots on each of 480 lines, or about 300,000 pixels. The size and quantity of the pixels affect the resolution (More pixels, small size = higher resolution).

- **Compression.** The reduction in size of data in order to save space or transmission time. Information is encoded in order to achieve this size reduction then unencoded to use the information.
- **Byte.** A group of 8 bits. A measurement of storage capacity.
- **Kilobyte.** One thousand bytes
- **Megabyte.** One million bytes
- **Bitmap.** How graphical images are displayed electronically: rows and columns of dots or pixels
- **TIFF, GIF, JPEG (JPG).** Graphical file compression formats; image format
- **Ratio.** A ratio is a relationship between two quantities.
- **Proportions.** A proportion is an equation of two ratios.



Materials

- An image editor
- Activity sheets
- Computers with Internet connection

Getting Ready

Overview

With faster Internet connections and higher memory capabilities, the connection between resolution and file size is becoming obscure. In the session, youth will need to learn how to manipulate image size for different purposes: for adding to a document or for transmitting over the Internet. (Printing images adds a whole new layer of information regarding the resolution of images, and we will not address that specifically in this session.)

Background

There are several ways that people use the term “image size.” It can refer to file size (i.e., number of bytes it will take to store the file), the number of pixels in a bitmapped image (e.g., 400 x 320), or it can refer to the display size of a particular output, say on paper or on the screen. The number of pixels and the color depth of an image are used to calculate the file size.

Sources

How to calculate image size:

<http://www.ncsu.edu/scivis/lessons/understandingimages/images1.html>

To learn about pixels and resolution:

http://www.washington.edu/accessit/webdesign/student/unit4/module2/web_graphics_basics.htm

To learn about bandwidth: <http://www.numion.com/calculators/> There are several fun tools here to use to understand how bandwidth works.

Warm-Up

Time:	5 minutes
Purpose:	Getting youth acquainted with image size - as interpreted by images.google.com
Materials	Internet-capable Computers

To Do

1. Ask youth to look up images for their project by using images.google.com
2. After they have started, ask youth to use the drop-down menu on the top left corner of the page. This menu allows them to see all, small, medium, and large images.
3. Ask youth if they see a pattern of how Google defines size. For example, what information is provided to show the user what the size of the images is? What seems to be the cut off for medium and large images? How long does it take to view the different images?
 - Google is using pixel and file size both in the refined search. It also shows the compression type (.gif, .jpg)
 - Small images are less than 50x50, and also probably under 10k file size.
4. Tell the youth they are going to learn about file and image sizes during this session. In making their websites, they will have to choose the size of their images carefully in order to ensure that viewers see the content speedily and that the client likes the design.

 **Challenge**

Time:	25 min
Purpose:	Scaling images by maintaining proportions of length and width. Youth will start off with one image and will resize by locking the ratio and by changing the ratio to see what happens to the resulting images.
Materials	<ul style="list-style-type: none">• Image editor• Image sizes table• Image bank (includes images that the youth can resize, recompress, etc.)

To Do

1. Ask youth to open image 1 in their image editor - can they determine the length and width of the image? What about the format? What is the size of the file?
2. Ask the youth to write as much information as they can gather in the Activity sheet.
3. Ask the youth to predict how they would reduce the image to half the original size.
4. Once you discuss their predictions, ask the youth to try out some of their suggestions. Did they work? How do they know? One way is by showing that the new image has half of the pixels in width and length than the original.
5. Have the youth write down the information about the new (half) image - including how big the file size is. Is it half the size of the original?
6. Encourage the youth to make the image smaller and smaller, larger and larger. Remind them to input as much information into the Activity sheet as they can. How small can they make the picture before it's hard to see clearly? How big can it get until it doesn't fit on the screen? Can they determine how big their screen is by the length and width of their image? Can they make the image bigger than the screen? To determine the size of the screen, youth can estimate based on the image size. How many of their image do they estimate fit in the screen. Also, youth can look up the information under system preferences / displays.
7. Ask the youth if they can think of any way to make their images smaller files. Show them that color depth also makes a difference in file size. Turn one of the images black and white or grayscale and see how that affects file size.
8. When the youth are done, ask them to share some of the things they learned about file sizes. Generally, the larger the image, the more file space it requires and vice-versa.



Main Activity

Time:	30 minutes
Purpose:	Scaling the right image size for the job
Materials	Activity sheets

To Do

1. Start a conversation about screen real estate for web pages.
 - How big is their browser screen, in pixels? [probably bigger than many people's screens]
 - How big do they think most people's browser screens are, in pixels? [many web developers create sites for 800x600 screens]
 - How big was the original image they were working with? How about other images?
 - Do they think image, browser and screen size affect their designs? [If yes, why? Are they thinking about having quality photos, or working with huge screens? If it doesn't affect them, probe why. In the end, we want to get them to think about scale - they will learn how to make images fit whatever space constraints they are given.]
2. Help the youth start working through the three scenarios given in the Activity sheet below. They will need to resize images to fit into different constrained screen sizes. Youth will have to calculate the ratio of the length to the width of the original images and then find the appropriate scale for the screen templates.

 **Discussion/Reflection**

Time:	10 minutes
Purpose:	Debrief activities
Materials	None

To Do

1. Ask youth to share what they've learned about working with images. Prompt for responses that range from specific tools, transformations, to the task of making sure that the images are the right size for a purpose.
2. Explain that although you didn't specifically teach it, they have been using ratios and proportions to solve the problems in the Activity sheets.
 - **RATIOS:** A ratio is a relationship between two quantities.
 - **PROPORTIONS:** A proportion is an equation of two ratios.
 - They have to know the ratio of the sides (say 400x300) in order to resize an image without affecting the way it looks. For example - in this case, the ratio is 4/3 - so they can always tell if the resulting image has the same ratio, say 800x600, 340x240.

Activity Pages

- Image Resizing Activity sheet
- Three Web Pages Activity sheet

Image Resizing Activity Sheet

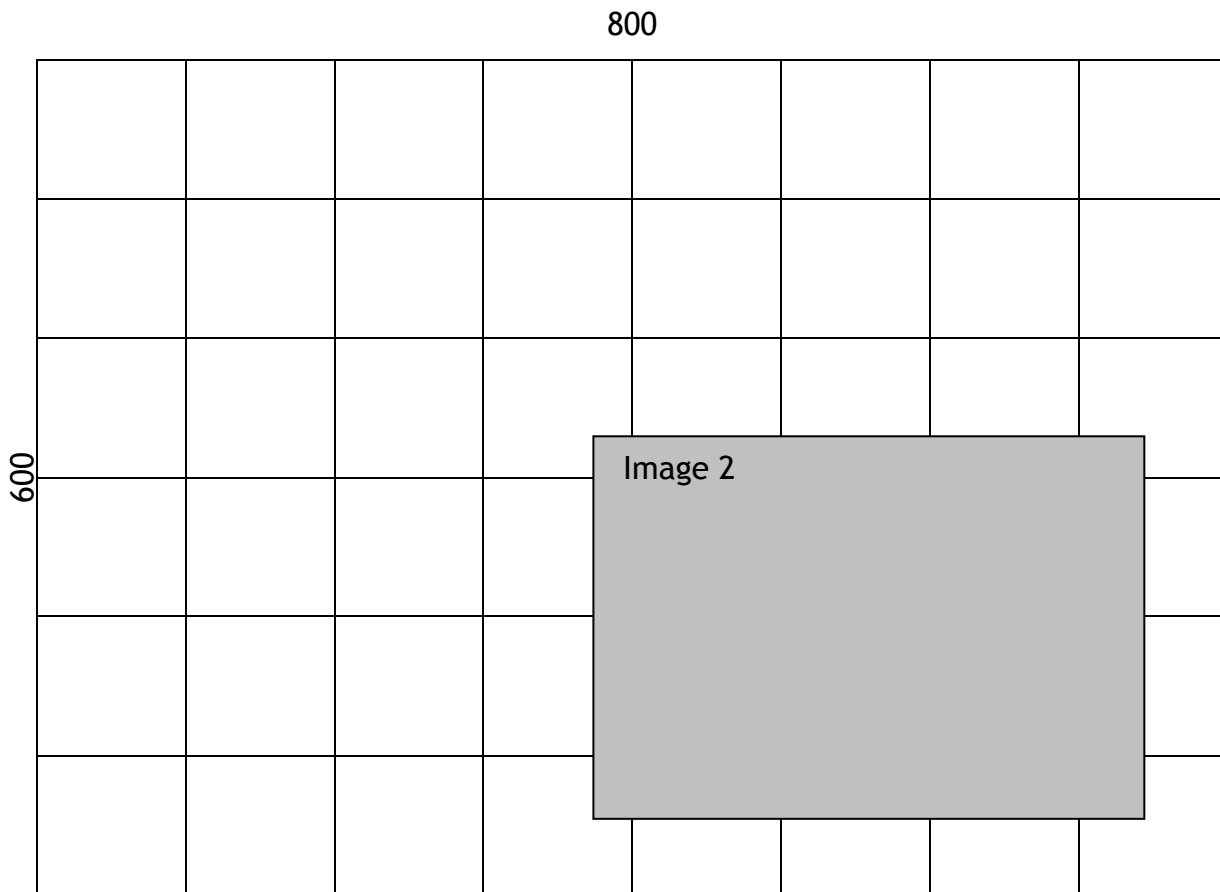
Image # / Description	Length (in pixels)	Width (in pixels)	File size	File format
Image 1				

Three Web Pages Activity Sheet

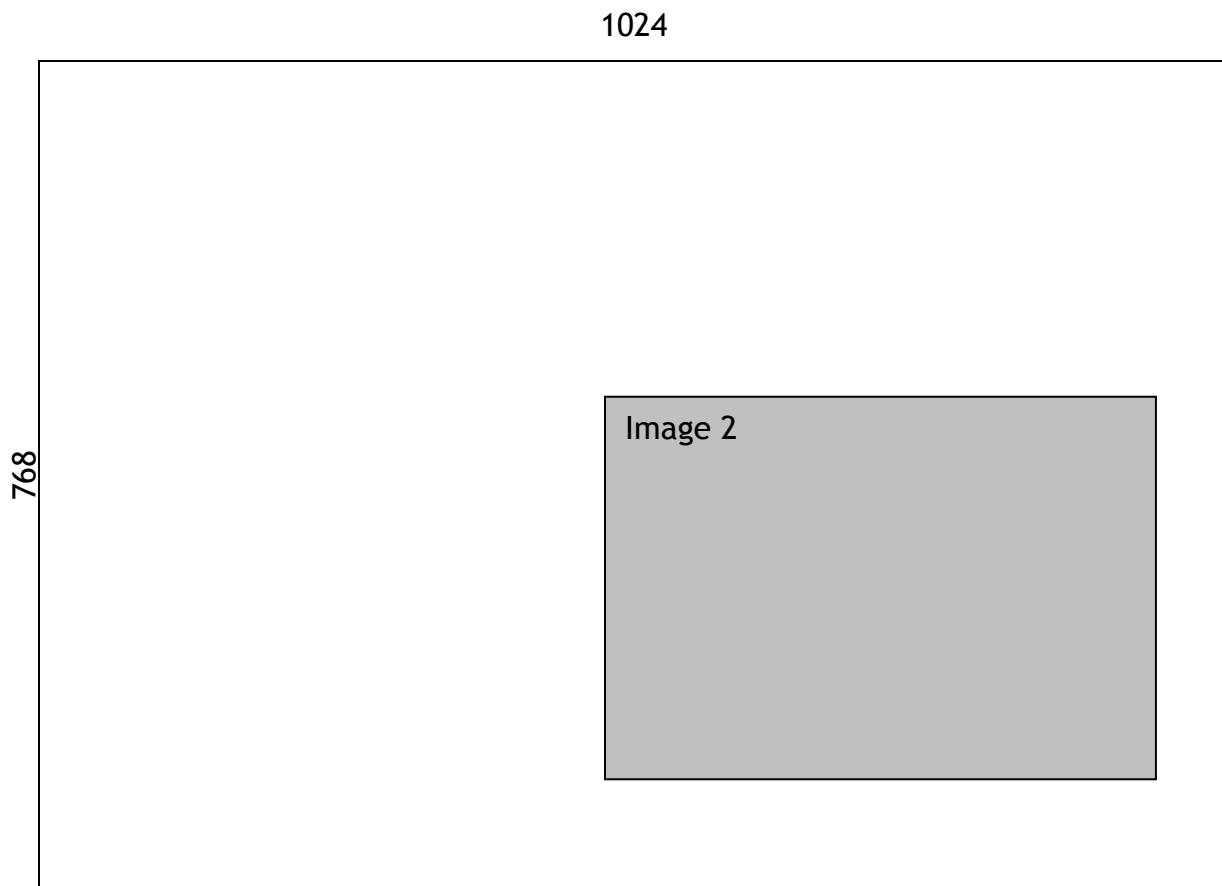
You are making a website for a client. You want to include at least one image on the home page and have asked the client for photos you can use. He sent you image 2.

To give your client an idea of various looks, make three layouts:

1. What are reasonable dimensions for the width and length of your image to fit in the template below, without affecting the image ratios.
 - a. How did you resize the image?
 - b. How do you know that you kept the same proportions of width and length as the original image?



2. Assume you have a 1024x768 browser screen. Can you resize the image so that you keep the same ratio of image to screen than in the first example?



3. After seeing the first two scenarios, the client said he liked the first layout, but requested that you add image 3 to the home page. This time, you need to make sure that your two images are no bigger than the space you had already determined for them.

