

Understanding Digital Images

Be Free To Teach



Pedagogically Speaking

You might consider incorporating images into your course content:

- to make it easier for your students to follow and remember the content,
- to illustrate complex concepts,
- as part of the course content,
- as a way to engage students with different learning styles,
- to set the context of a topic,
- to enrich the learning climate, or
- simply to dress it up.

Accessibility

Images increase download time - there's just no getting around that. So, before you run off and flood your Blackboard site and PowerPoint presentations with graphics, think about why you're using the images.

The reason for the image may help you determine the way it is included (or not) for online delivery. Sometimes images used in lecture can be removed from a PowerPoint presentation before posting it to the web making it easier for students to access the material. At times when the images are necessary, it may be important to warn students that particular files may take a long time to download from a dial-up modem.

Inclusive Classroom Considerations

When working with images, especially images of other human beings, it is important to take several things into consideration. While no one would consciously teach in a manner that would exclude students, sometimes we do things unconsciously that make certain students or groups of students feel uncomfortable or not involved in the class. You know what you are trying to accomplish by using a particular image, but the students will not. They will make assumptions and draw conclusions based on the image or images you use. Images are powerful and we need to use them thoughtfully.

Handout Highlights

Pedagogically Speaking

Accessibility

Inclusive Classroom

Copyright and Fair Use

File Size

Storage

Formats

Tips for Success

Resources

Resizing with Photoshop



Here are some questions to ask when selecting images for use.

▮▮▮ Who is included? Who is not included?

▮▮▮ How are those who are included represented? Positively or negatively?

▮▮▮ Do the images reinforce stereotypes in any way? (If they do, or might to some students, don't use them.)

▮▮▮ What assumptions might students make from the images you use?

For an excellent discussion of this topic, see the following publication (also included in your *red folder*):

▮▮▮ **Cultural Diversity in Publications: Guidelines for Good Practice**

The University of Melbourne

http://www.unimelb.edu.au/diversity/pdf/CD_Publications.pdf

"Every student should have a person who wants to help him or her become the person he or she is capable of becoming."

-Louis Schmier

General Strategies for Teaching and Presentation

http://ds.uoregon.edu/fac_guide/

Highlight major concepts and terminology both orally and visually. Be alert for opportunities to provide information in more than one sensory mode.

Use visual aides such as diagrams, charts, and graphs; use color to enhance the message.

Working with Students with Disabilities

(Material taken verbatim from cited website.)

▮▮▮ **University Of Oregon Disability Services Homepage**

<http://ds.uoregon.edu/>

▮▮▮ **Disability Services Faculty Guidebook**

http://ds.uoregon.edu/fac_guide/

▮▮▮ **Strategies for Optimizing Learning**

http://ds.uoregon.edu/fac_guide/opti_lear.htm

Many teaching strategies that assist students with disabilities are also known to benefit students without disabilities. Instruction provided in an array of approaches will reach more students than instruction using one method. The following suggestions are designed to assist you in meeting the growing diversity of student needs in the classroom, particularly those related to disabilities. Please let us know if there are other strategies that you have found



to be effective

Two Important Points

|||| The needs of and necessary accommodations for students with disabilities will vary dramatically even within the same disability type. Always talk with the student about her/his specific needs and consult with Disability Services as needed.

|||| Most disabilities are not obvious. NEVER assume that you do not have a student with a disability in your class.

Place a **statement in your syllabus** and **make an announcement** at the first meeting of the class such as:

"If you have a documented disability and anticipate needing accommodations in this course, please make arrangements to meet with me soon. Please bring a notification letter from Disability Services outlining your approved accommodations."

Faculty Guidebook

Optimizing Learning for Students with Specific Disabilities

http://ds.uoregon.edu/fac_guide/fg_opt_spef.htm

The following pages address some categories of disabilities and include a definition, characteristics, considerations, instructional strategies, and accommodations which may be recommended to assist the student.

Blind/Low Vision

Accommodations (may include): (edited list)

http://ds.uoregon.edu/fac_guide/fg_opt_spef.htm#two

|||| Reading aloud materials from overheads, blackboards or handouts

|||| Giving a verbal description of class activity, such as when a show of hands is requested, stating how many hands were raised

|||| Using black print on white paper to allow for maximum contrast

|||| Making class assignments available in an electronic format, such as e-mail, to allow access by computers equipped with voice synthesizers or Braille output devices

|||| Raised line drawings and tactile models of graphic materials



**University of Oregon Adaptive Technology
Designing Web Accessibility for People with Disabilities
http://darkwing.uoregon.edu/~atl/web_acs.htm**

Images

<http://darkwing.uoregon.edu/~atl/awp5.htm#80>

Always include an informative "alt text". Some designers recommend rather detailed descriptions. Try at least to avoid being vague. "University of Oregon Logo" is better than just "Logo." A good test is to clear your cache, turn images off, and navigate your site. You should be able to quite easily.

*"The highest reward
for man's toil is not
what he gets from it
but what he
becomes by it."*

-John Ruskin

Copyright and Fair Use

Educational use of copyrighted material can sometimes be justified through the "fair use" clause in federal copyright law. The goal of this section is to briefly define the elements of "fair use" and to lead you to more substantial sources for information about how copyright law applies to teaching with the Internet.

Factors of Fair Use

If you use a piece of copyrighted material in your teaching, four factors will determine whether or not your use of that material qualifies as "fair use." Note that **ALL FOUR** of these factors must be evaluated for fair use to apply.

1. **What is the nature of the use?** Is the reproduction or the distribution for education or for commercial gain?
2. **What is the nature of the copyrighted work?** Fiction, high-level analysis, works of art, and musical composition are considered the most creative and therefore receive the most protection from infringement. Compilations and derivative works are usually not protected by copyright at all (except possibly in their format or user interface).
3. **What is the quantity of the work used?** If you use 3% of the total substance of the work or less, you are probably safely within fair use. If you use more than 10%, you are in uncertain territory.
4. **What is the potential impact on the copyright holder's market?** If your use of some material could materially reduce the creator's ability to profit from it, this factor would point toward your use not being "fair".

The fact that a work is unpublished shall not itself bar a finding of fair use if such finding is made upon consideration of all the above factors. NCSU's Copyright Tutorial (<http://www.lib.ncsu.edu/scc/tutorial/basicintro.html>) provides more information on each of the four Fair Use criteria.



Additional sources of information are:

||| **Copyright Principles in Action**
(<http://darkwing.uoregon.edu/~copyrgh/>)

||| **The CONFU website (U.S. Patent and Trademark Office)**
(<http://www.uspto.gov/web/offices/dcom/olia/confu/>)

||| **The Educational Multimedia Guidelines**
(<http://www.uspto.gov/web/offices/dcom/olia/confu/appendix.htm#j>)

||| **Christine Sundt's Copyright & Art Issues**
(<http://darkwing.uoregon.edu/~csundt/copyweb/>)

||| **Stanford University Copyright and Fair Use**
(<http://fairuse.stanford.edu/>)



What Determines File Size?

File size is an important factor when working with digital images. Your intended use for the image will play a large part in determining the acceptable file size. The file size for high quality print images will undoubtedly be much larger than images intended for web use, while images to be displayed through presentation software such as PowerPoint will fall somewhere in between.

Image Dimensions

When we talk about the Image dimensions we are referring to the actual width and height of the image. A full screen image displayed on a 13" monitor is 640 pixels by 480 pixels. Typical dimensions for Mac and PC monitors are 832 pixels x 624 pixels for a 17" monitor and 1024 pixels x 768 pixels for a 21 " monitor (more or less).

You will determine your image dimensions at the time you digitize. These dimensions can be decreased at any time. *Increasing the dimensions will distort the image, however.* Therefore, if you are unsure about the final dimensions or you have multiple uses in mind, you should set your dimensions to the largest size you may want and decrease them as needed.

Image Resolution

Image resolution is defined as the number of pixels per inch, or ppi, when talking about on screen display, and dots per inch, or dpi, when referring to print images. These measurements refer to the spacing of pixels in your image. The resolution you want will depend on what you intend to do with the image. The following are basic guidelines.

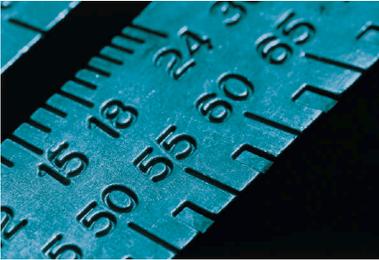
"The ability to perceive or think differently is more important than the knowledge gained."

-David Bohm



What Determines File Size?

Continued



||||| **Monitor Display**--If you intend to display the image on a monitor, the final image resolution need only be between 72 ppi and 96 ppi. Digitizing at a higher resolution such as 150 ppi or 300 ppi would be suggested if you plan to manipulate your image. More pixels mean more information to manipulate and less unwanted distortion from manipulation. After you have finished any manipulations, you can reduce the image resolution down to 72 or 96 ppi to decrease file size.

||||| **Print Quality**--If you intend to print the image, you will want the highest resolution the printer can support, usually 300 dpi to 2400 dpi. The resolution of your image can be decreased any time after digitizing. Increasing the resolution will distort the image, however. Therefore, if you are unsure of your intended output or have multiple uses in mind, it is advised that you set your resolution size to the maximum you will require and decrease it later as you create additional files.

Every pixel translates into digital information, so there is a direct correlation between the size and resolution of an image and how large the file will be when the image is saved.

File size increases dramatically as resolution increases. When working with digital images, it is important to consider how to balance the size and quality you wish to have while also maintaining a file size that does not take up more disk space than required and is small enough to allow convenient uploading and downloading.

Image Bit-Depth (Pixel Resolution)

Image bit-depth refers to the number of bits of stored information per pixel. Each pixel contains data that describes whether it is black, white, or a level of color. (Storing the information in a single pixel can take different amounts of memory, depending on how much grayscale or color information is needed.) As a general guide:

||||| A **black-and-white** pixel takes only 1 bit to store the information

||||| An **8-bit grayscale** (256-level gray-scale) pixel takes 8 bits to store the information.

||||| An **8-bit color** (256 colors) pixel takes 8 bits to store the information

||||| A **16-bit color** (thousands of color) pixel takes 16 bits to store the information

||||| A **32-bit color** (millions of color) pixel takes 24 bits to store the information



What Determines Storage Options for a File?

Where you will be able to store your file depends on three things: image size, the storage media available to you and the computers you're working on.

Image File Size

Image file size is usually expressed in Kilobytes (K), Megabytes (MB), or Gigabytes (GB) and is proportional to resolution. Keep in mind that 1000 K is more or less equivalent to 1 MB and 1000 MB is more or less equivalent to 1 GB. For instance, your full screen, (640 pixels by 480 pixels), image set at a resolution of 72 ppi will take up approximately this much disk space ... (Note that these file sizes do not take into account compression).

- ||||| A black-and-white image will occupy **100 K**
- ||||| An 8-bit grayscale/color image will occupy **300K**
- ||||| A 16-bit color image will occupy **600K**
- ||||| A 32-bit color image will occupy **1000K**



Storage Media

Common types of storage media are changing with the emergence of new technologies. Frequently you may choose to use CD-Rs (approximately 650MB of storage) Zip disks, (100-250 MB depending on the type) or another type of external storage device such as a keychain storage system. It is best to know which storage media you will need to use before you begin digitizing. What type of storage you can use will depend on the file size and what equipment is available at the workstation. Some computers are equipped with more than one option for storage.

Computer Platform

Often your storage media may come preformatted for either Mac or Windows but which format you can use depends on what computers you will be working on. IBM computers will NOT read Macintosh formatted media. Therefore, if your storage device will, at any time in this process, need to be inserted into a PC, you MUST use an Windows formatted or Windows compatible device. Macintosh computers will read media formatted for either platform. So... if you digitizing on a PC for use on either platform, you need to use a Windows formatted storage device. If you intend to take the file to a PC after digitizing, you will also need to use an Windows formatted storage device regardless of the platform you are digitizing on. If you are using a Macintosh and plan to take it to a Macintosh, the formatting of your storage device is generally not a factor.

What are the different formats I can use? Which should I choose?

"In wisdom gathered over time I have found that every experience is a form of expression."

-Ansel Adams

The format you use to save your file will be determined by its intended use. Some formats are common for the web, others for presentation or print. There are several graphic file formats you may encounter. Listed below are some of the most common. Many programs will accept several file formats and may possibly convert others. Knowing your program is the best way to determine which format will work best for you. Files can be converted from one format to another with little trouble. Be aware though that some formats remove information from the images in order to decrease the file size and this information cannot be retrieved at a later time by conversion to a different format.

|||| **PICT** stands for 'Picture' and is used for storing 8-bit, 16-bit or 24-bit color or gray scale images. PICT files work well for the on-screen presentation of graphics. This is the preferred standard for many Authoring, Presentation and Word Processing software packages although several of these programs will also take JPEG files, (explained below). **NOTE: Remember that the .pic extension is needed for PC files.**

|||| **TIFF** stands for 'Tagged Image File Format' and is used for storing grayscale and color images. TIFF files retain more information than PICT files and therefore create a larger file. This format is used frequently when an image is used for display or print. This is one of the preferred formats for most Desktop Publishing software packages. **NOTE: Remember that the .tif extension is needed for PC files.**

|||| **GIF** stands for 'Graphic Interchange Format', which is used for simple web images. Because GIF files are limited to 256 colors, it is suggested that you not use this format for photographs or other images with high color ranges. Note also that you can make the background of GIF files transparent, which works well for web pages with tiled backgrounds. **NOTE: Remember that the .gif extension is needed for PC files.**

"There is no try; there is only do or not do."

-Yoda

|||| **JPEG** stands for Joint Photographic Experts Group. JPEG is actually not a file format even though it is frequently referred to as one. It is actually a standard method of compressing graphics by removing nonessential information. Because saving as a JPEG removed information from the image, it is suggested that you do not save using this file format until you are finished manipulating your image. A JPEG file can be created from most file formats and is frequently used for web-based images because small file size is essential. **NOTE: Remember that the .jpg extension is needed for PC files.**



||||| **Bit Map** images are used for simple black and white images. Note that 'black and white' refers to those images that have only two tones, either black or white. Images that contain a range of grays, (like black and white photographs), are called grayscale images. You do not want to save grayscale images as Bit Map files. Doing so will translate the value of the grays to either a black or white tone and you will distort your image. **NOTE: Remember that the .bmp extension is needed for PC files.**

For the purposes of sharing files, adding images to PowerPoint presentations and posting them to websites, the formats you are most likely to use are JPG and GIF. These files are almost universally readable by image editors, work well on websites, and offer small file sizes with reasonable quality levels.

Working with Digital Image Files

The UO Distance Education Program offers these tips regarding working with digital image files:

"People change more often because they feel the heat than because they see the light."

-Janet Feldman

||||| Use JPG (also seen as JPEG) or GIF files

||||| For images that will just be used on web pages, the files should not be very large (less than 300k)

||||| If you are going to share files, keep file names simple and easy to type

||||| Use descriptive file names for images to make it easier to remember what they are - selfportrait.jpg, sunset.gif, or artmuseum.jpg, for example

||||| Keep back-up copies: NEVER WORK ON AN ORIGINAL FILE! Always save a copy of an image before doing anything to it - some changes cannot be undone

||||| Color is information - Black and White images result in smaller files than Color images

||||| Large images on web pages take a long time to load - keeping images small and at screen resolution not only helps to make uploading them easier, but it makes the web page they are on load faster

||||| Establish a specific place to save your images - a "My Pictures" directory on your hard drive, for instance, or a particular Zip drive, CD-R/RW, etc. that is used only for image files - this makes it much easier to find the files later on when you need to upload them or otherwise work with them



Working with Digital Image Files

Continued

Save your work: save an original copy for safekeeping, and then save another copy every time you are about to make a significant change to the image - this way you can always go back if you don't like the result

Changing Image Size in Photoshop

This brief tutorial will show you the basic information necessary to take a digital photograph and change its size (both in terms of height and width as well as computer file size) so that it can be used on the Internet. It was originally created for student use by the UO Distance Education program and can be found in its original form online at:

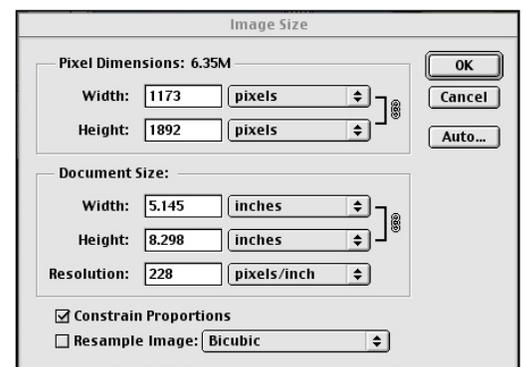
<http://de.uoregon.edu/help/changePS.html>. With permission, it has been adapted for our purposes included in this handout.

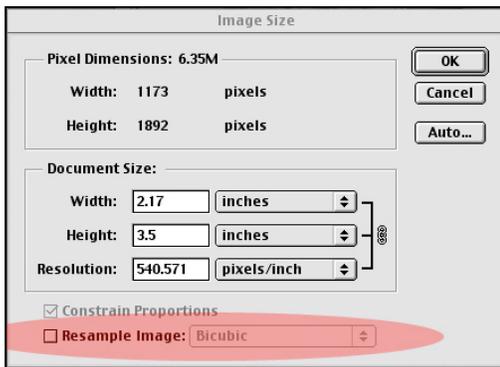
The program used is Adobe **Photoshop**, which is a high-end graphics program available at almost every UO computer lab, including the FITT Center. Follow these instructions to prepare a picture for posting to a website or for inclusion in your PowerPoint presentation.

Note: If you do not have access to this software, the basic information and procedures will work with any digital imaging program that has similar capabilities; the terminology may differ, and the controls may not be the same, but the basic aspects of size and resolution are the same no matter what the software being used.

1. Pull down the **File** menu to select **Open**.
2. **Locate** your image file and click **Ok**. Your image should open up in Photoshop. Before doing anything else, *SAVE A COPY OF YOUR PICTURE!* This way, if you make any mistakes you always have a back-up of your file.
3. Pull down the **File** menu to **Save As**.
4. **Rename the file** so you can easily distinguish it from the original.
5. Click the **Save** button. Now that you have a copy for safe-keeping you can resize the new image file.
6. Pull down the **Image** menu select **Image Size**.
7. A **window will open** with the information about your particular image file.

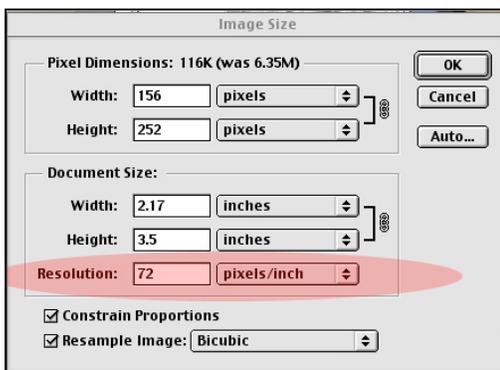
As you can see from this information, the picture opened is 5.145 inches wide and 8.298 inches tall, so it would fit comfortably on a letter-size piece of paper. At this height and width, the *resolution* is 228 pixels per inch (ppi). The combination of these, the height and width of the picture along with the resolution, results in a file that is 6.35 megabytes in size - far too big to be reasonably used on the web. The picture we see displayed on our computer screen does not look huge, but that is because it is being shown at a reduced size. We need to change the size of this image before it can be used on the Internet.





Check out what happens if we change the size (height and width) of the picture without adjusting the resolution (pixels/inch). Note that the resolution has jumped to 540.571 pixels per inch! This happened because the highlighted box was turned off. **Resample Image** needs to be on for changes to be made to one or the other characteristic of an image without also affecting the other. It's also a good idea to leave **Constrain Proportions** checked. This option automatically updates the width as you change the height, and vice versa.

Since we only want to use the picture on the Internet, we do not need a resolution higher than a computer screen can show. The general standard for computer monitors is either 72 or 96 ppi, so choose one of these resolutions for your picture.



In the picture to the left, you can see the final result of the change - we now have an image that is 2.17 inches wide, 3.5 inches tall, and has a resolution of 72 pixels per inch. Notice that the file size is now only 116 kilobytes, which is appropriate for use on the web. (The original file was 6.35M, or 6,350,000 bytes of information while the new file is 116,000 bytes.)

The last thing you need to do now is **Save** the new, web-ready version of your image. Give it a new name to avoid saving over your original version. For most purposes you will want to use the **JPEG** file format (also seen as **JPG**). JPEG is a kind of file that can be read by web browsers, is capable of very high image quality, and also uses less space on a disk than most other picture file formats. ***If you do not use the right file format your pictures will not work on the Internet, so be sure that you save in JPEG format to be sure your images will be ready to use on the web.*** There are other formats that will work, but for most purposes you are safest sticking with JPEG files.



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Resources

Download Time Calculator

(<http://www.absolutecross.com/webmaster/tools/download-time/>)

This tool will help you quickly calculate how long your file will take to download with certain Internet connections.

Adobe Photoshop Tutorials

www.adobe.com/products/tips/photoshop.html

This site offers tips on converting color images, retouching, using layer comps, posterization, and more.

About Our Organization...

The University of Oregon supports the teaching endeavors of its faculty and graduate students through the Teaching Effectiveness Program (TEP), a division of Academic Learning Services.

The Teaching Effectiveness Program offers a variety of activities and services to engage the academic community in viewing, assessing, and improving undergraduate instruction. TEP services are free to faculty members, graduate teaching fellows (GTFs), and university departments.

