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Introduction

Digital photography is a powerful tool for educators. Lucky for us, classroom applications abound! And increasingly, digital photography is a hobby (application) that has become affordable and easy to learn. This book will review several tips and tricks to assist you in integrating digital photography into your school curriculum. If you are a high school level instructor, you may find value in many of these project ideas, as they can easily be adapted to serve the needs of all ages of students. This book is not only for those with digital cameras, because you don't need to have a digital camera to enjoy and utilize the lessons found inside. Any image that can be developed at your local store can be saved to a disk for an additional fee. If you have access to a scanner, you could also scan in any prints that you have already developed.

The lessons in this book are presented in a consistent format for easy implementation, as follows:

- Brief Lesson Introduction
- Appropriate Grade Level(s)
- Appropriate Subject Area(s)
- Materials Needed
- Activities (steps 1, 2, 3, etc.)
- Examples or Samples

You'll also find Tips and Tricks as sidebars that provide valuable hints to make your projects even better.

With nearly all lessons, there are project examples to be found on the accompanying CD-ROM. These can be used as templates in your classroom.

What you will not find in this book are advanced photo editing techniques such as red-eye removal, manual exposure settings, time-lapse photography or QuickTime VR panorama-style movies. While scanners and other devices are mentioned as great tools to digitize photos, we will not discuss scanning techniques, or advanced settings. Features and functionality of digital cameras will be discussed throughout the book, but not specifically by manufacturer or model.

Before we jump into the nitty-gritty of the lessons, I thought it could be useful to provide you with a brief primer on digital photography concepts, tips on shopping for digital cameras and additional gadgets, and descriptions of graphic editing and presentation software mentioned in the book, as well as a quick overview of how to instruct students in the use of digital cameras.

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Digital Photography Concepts

Pixels, megapixels, resolution, media format, digital zoom, and USB; if these terms are unfamiliar to you, do not despair. Pixels are the dots of color that make up any digital image. Think of them as the tiny dots of light you can see if you lean very close to a color TV screen. You remember doing that as a kid, right? Blue, green and red dots of color seemed to magically meld together to form the image. These are the same kinds of dots that make up digital images. They are referenced as numerical values in a width-by-height measurement. For instance, the computer screen I am currently typing this page on displays 1024 x 768 pixels on my monitor. This is often referred to as dots per inch, or "dpi." Digital purists may even refer to it as "ppi" to correctly identify the dots as actual pixels per inch. This size choice is referred to as "resolution." Early digital cameras could only shoot images at one resolution, 640 x 480. This is a sufficient resolution for popping images into PowerPoint, Hyperstudio, or posting to the web. However, when you actually print them from your computer, these images are clearly inferior to standard 35 mm prints.

The term "megapixel" is a numerical value, computed by multiplying the width by the height. If the resulting number is around one million, you've got 1 Megapixel! Camera companies are rapidly working on increasing this number, and we are now at a point at which the highest resolution digital camera images rival 35mm images in quality, detail and color reliability. Keep in mind, however, the larger the resolution, the larger the file size of the digital image (see figure 1 for a rough approximation). The big advantage of digital, of course, is that these raw images are always the same quality. There's no loss from your original to any number of copies you wish to print. You can burn a CD, e-mail a friend, or post them to the web without ANY loss of quality (sometimes referred to as "generational loss").

Image size (pixels)	8MB	16MB
640 x 480	72	147
800 x 600	50	100
1024 x 768 (1 megapixel)	34	69
1280 x 960 (1.2 megapixel)	16	31
1600 x 1200 (2 megapixel)	8	16
2048 x 1536 (3 megapixel)	3-5	8-10

Figure 1

Digital Photography Concepts *(cont.)*

As the technology advanced, and digital cameras became popular, consumers and professionals alike demanded better quality resolution from their cameras. And the digital camera industry quickly responded. Currently, five-, six- or even seven- megapixel cameras are available for the high-end professionals. Such cameras cost thousands of dollars, however. This is a huge benefit for education. "Why?", you ask. The professional users of these state-of-the-art cameras drive down the cost of the lower resolution cameras (two-, three-, and four-megapixel cameras) to affordable ranges. Educators, PTA groups, foundations, and yes, even teachers can now wrangle together enough funds to get one of these lower resolution cameras for general school and classroom use. The upshot is that we're not sacrificing too much in the way of quality in terms of printing either. A two-megapixel image has just enough resolution to print a beautiful 8" x 10" glossy photo on a regular inkjet printer. The most expensive part of this equation is the special photo quality paper which can sometimes run as much as $1 per page. For most classroom projects (and every project in this book), 8" x 10" is more than enough. The chart illustrates minimum size requirements for most of the common photo print sizes (see fig. 2).

One thing often forgotten in the use of digital photography is that the project does not have to start with a digital camera. Nearly every 35mm film developing service (even your local grocery store) will develop your photos AND return digital copies of your prints for a fee. In some cases, they'll even save multiple resolutions of your images (high, medium and low resolutions) for print, presentation and email, respectively. This is something to consider before purchasing an expensive digital camera when you have a perfectly useful 35mm camera. This approach can get expensive as well, but if you are looking for the best of both worlds (print quality and digital functionality), you may want to consider this option. There are now even digital disposable cameras that are dropped into the slot at your local store just like regular disposable cameras. For all of these reasons, every lesson in this book could be done with *either* a digital or a film-based camera.

Print size (inches)	Resolution (pixels)
wallet	640 x 480
4 x 5	768 x 512
5 x 7	1152 x 768
8 x 10	1536 x 1024

Figure 2

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Shopping for a Digital Camera

Digital cameras are promoted, priced and advertised based on the features and tools built into the camera. Over the years, I've collected some advice to offer when shopping for a digital camera:

1. Buy a camera that offers you the resolution you need. Don't be lured by the more expensive, high-quality four- or five-megapixel cameras, if you are only going to be printing snapshots for your classroom, or inserting images into presentation software. If you teach or are the advisor for journalism, yearbook, or other print-heavy subject, you may be the exception to this advice. If you have the funding for it, go for as many pixels as you can get.

2. Only pay attention to the camera's "optical zoom," as "digital zoom" values are virtually useless. This is an interesting development in digital camera marketing. Manufacturers are using digital zoom to deceptively inflate the zoom amount (usually a number followed by an 'x' to represent the amount of magnification you can obtain on a given camera). Optical zoom matters because it represents the amount of magnification your camera lens can actually offer. Digital zoom merely blows up the same pixels to create a closer, but blurrier view of a subject (see fig. 3 for an example of optical vs. digital zoom). Not quite worth the hullabaloo, in my opinion. Somewhere on the camera box, or on the web site for the camera, there should be distinction between optical and digital zoom ratings for the camera. A good educational digital camera should have a 2x or 3x optical zoom. More is great, but for most classroom uses, not necessary.

3. Buy a bag with padding for the camera. The more pockets, the better. Someone, and it may just be you, will eventually drop the camera. Better to keep it in a padded bag when this happens. This tip becomes especially pertinent if you plan on sharing the camera between teachers, grade levels or schools. Pockets are invaluable for storing extra batteries, media cards, chargers, etc.

Figure 3

Shopping for a Digital Camera *(cont.)*

4. Buy extra batteries. If the camera comes with a rechargeable proprietary battery, buy an extra one. If it uses AA, or another standard type of battery, buy rechargeable versions of these. Most schools are not well set up to reimburse teachers for consumables like batteries, so it's best to buy rechargeable ones at the same time the camera is bought. You might also find that the batteries for your particular camera eventually become unavailable due to obsolescence or other changes in the market.
5. Buy extra storage media. Most cameras come with one small capacity digital media storage card. These come in many formats (see fig. 4). Your camera will only use one of these types of media, so it's best to buy a second card of larger capacity to allow you to switch them when the first, smaller card fills up. This is especially important if you plan on taking your digital camera on field trips or other activities far away from a computer. The most common storage format used in digital cameras is currently Compact Flash (CF).
6. Choose a camera with video-out capability. This may not be available for some models, but if you can get it, I'd recommend it. This feature allows you to view your digital images on your television, record a slideshow, or even use your camera as an overhead document camera for instructing students in close-up activities.

Other Useful Gadgets

35mm Camera

Yes, you can still use your trusty 35mm camera to get digital images! When you take your film to be developed, check the box on the package for photo disk or CD-ROM, or something along those lines. This will cost a little bit extra, but the bonus is that you that get beautiful prints *and* digital images— the best of both worlds!

Scanners

You can use a scanner to digitize any non-digital photos, slides or negatives, sometimes two or more at a time. This is great if you don't have a digital camera, but would like your prints digitized for editing, emailing or presentation.

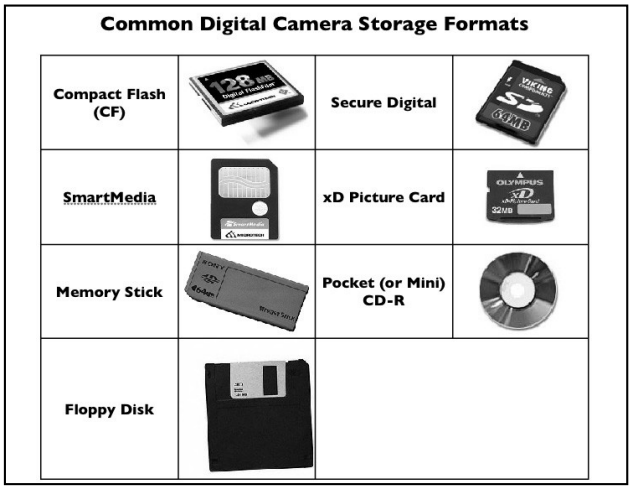

Figure 4