

# Technology: Tools

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Computers

Camcorders

Internet

Much  
MORE!!!!

Scanners

Audio  
recorders

## Scanners

Scanners convert printed or transparent material into digital images. Consider a copier machine that copies a document quickly and accurately. Scanners are similar, but they translate a printed document or photo into digital form, which can then be modified, printed, used on a Web page, or saved for future use on a hard drive, floppy disk, or CD-ROM.

According to our favorite Web site, [www.about.com](http://www.about.com), two types of scanners are commonly used today. "**Flatbed scanners** usually come in letter or legal sizes, and they can scan printed material. Flatbed scanners can scan transparent media with an adapter called a 'transparency adapter' or 'light lid.' **Slide scanners** (or film scanners) are designed specifically for 35mm slides or negatives."

<<http://peripherals.about.com/library/ref/blscannerfaq.htm?terms=scanners#whatisscanner>>

Most likely, you or your students occasionally see a picture or piece of artwork that would make an interesting addition to a multimedia program. Capturing these images with a computer-connected scanner allows you to do just that. As mentioned above, think of it as being similar to making a copy using a photocopier. The paper copy, photo, or whatever is to be copied is placed on the scanner. A light passes under it as the picture is scanned, and a computer image is created. This image is composed of dots, or picture elements, called pixels. Rather than creating a copy of the picture on a sheet of paper, as a copier does, the "bitmapped image" (technical jargon for a computer image) is transferred to the computer screen.

Scanners come with software that you load onto your computer when you connect the scanner for the first time. This software provides a number of settings that help you manipulate the image by specifying (a) the number of colors displayed (if any; you can turn a colored image into a black-and-white image), the amount of the image that is scanned (you can "crop" or cut away pieces of the image), and the resolution of the image. Understand that the higher the resolution, the more memory the image will take on your computer or multimedia project. A resolution of about 72 dots per inch is usually sufficient for most multimedia uses. So there is a lot of compromise that takes place when using images.

Think of an activity (mini-lesson) you have planned for your students. How can pictures, artwork, or photos be used to enhance meaning? (Note: Think back to Module One and the TKAM lesson plan. One mini-lesson involved the use of pictures to help the students understand the setting of the novel by depicting photos taken during the Depression. This may be helpful in your planning.)

## Scanning Tutorials

Below is an example of the beginning of a scanning tutorial provided at <http://www.scantips.com/basics01.html>. At this web site the author, Wayne Fulton, provides a step-by step procedure in how to use a scanner. Mr. Fulton has graciously allowed us to show his first page, to give you a sense of what a scanning tutorial looks like. This site is particularly impressive because it describes key words for the user. Here is the information:

We scan for the capability of our output device.

We choose the scan resolution based strictly on the needs of the output device that will process that image. At home, that output device is normally a printer or a video monitor.

Video monitors and printers work very differently from each other and must be discussed one at a time. All of the rules are different for images intended for these two devices. The following material details the significance of these differences. (When I say "video," I mean the video monitor screen.)

All of the points below will be covered.

Properties of Printed Images	Properties of Video Images
Image size is measured in inches	Image size is measured in pixels
Image size does NOT vary with scanned resolution	Image size varies with scanned resolution
Image size is modified on paper by scaling	Image size is modified on screen by resampling
Image pixels are spaced on paper using specified scaled resolution	Image pixels are located at each screen pixel location, one for one
Several printer ink dots are used to represent color of one image pixel	One screen pixel location contains one image pixel, and can be of any RGB value

So because of these great and fundamental differences, when the text says "it's this way" or "it's that way," then notice that it also says "for printing" or "for video." Don't get them out of context, because the two modes are very different, with different properties and concerns.

The next page will discuss "What is a pixel?", but before we get started, a note relating to context usage of "dpi":

### **DPI, SPI, PPI - Which to Say?**

Printer ink dots and image pixels are very different concepts, but both use the term dpi in their way.

Beginners sometimes assume that because inkjet printer ratings use dpi, then therefore image pixel spacing *MUST* be called ppi, to distinguish them differently. These are indeed different situations, and ppi is fine as a personal preference for resolution if you wish, but to call it a rule ignores the vast bulk of existing real world practice.

Some literature does attempt to reserve use of the term **dpi** to be used exclusively for the ink dots made by inkjet printers, because that's so different from everything else. Then we hear scanner resolution called **spi** (Samples Per Inch), and that is indeed what it is (we call these color samples "pixels"). We hear image resolution called **ppi** (Pixels Per Inch), and that is indeed what it is. The spi and ppi usage is precisely correct.

But pixels are a kind of colored dot too (more a concept than a physical colored dot), and while dpi may be jargon in that way, the term dpi is also definitely correct for "pixels per inch". Dpi is in fact the printing industry's long

pixels on paper... it has simply always been called dpi, meaning "pixels per inch".

So yes, **inkjet printer rating dpi** is something entirely different, referring to inkjet printer **ink dots** instead of image pixels. The inkjet printer simulates the color of one 250 dpi pixel by making several ink dots of four CMYK colors, located perhaps on 1200 or 1440 dpi spacing (See the [Printer Basics section](#)). Image pixels and printer ink dots are NOT the same thing at all.

Except for that dpi specification of inkjet printer ink dot locations (which is a very different concept from image pixels), and except for lpi used for prepress, then when referring to images, or to printing images, we can treat these terms, **spi**, **ppi**, and **dpi**, as the same equivalent concept - they all simply refer to image pixels per inch - the spacing of image pixels on paper. You may use your own preference, dpi or ppi, but you are going to have to understand it either way, because you are always going to see it both ways.

The term pixel is a computer abbreviation for *picture element*, the smallest element of a digital image. Pixels are a very different concept than the ink dots that inkjet printers can make. The idea of printing these pixels in digital images is **always about pixels per inch on paper**. All three terms (dpi, ppi, spi) are the same image pixels per inch - the spacing of image pixels on paper.

are good names too, there is nothing wrong with them, but the fact remains that common and historical usage has always called it dpi. For example, continuous tone printers (Frontier/Noritsu/Lambda/Lightjet types, and dye-sub) don't print discrete ink dots of three colors like inkjet printers must, instead they mix the color of the pixel directly. However, you will notice that these printer ratings still refer to the spacing of those pixels with the term dpi, simply because dpi has always been the name for the term "pixels per inch".

**Scanner ratings also always call it dpi**, also referring to pixels of course. I always say dpi too, simply because that has always been the name for pixel resolution.

Ppi is a fairly recent new term, and we are seeing ppi used more now, and it is a perfectly fine name too. Recent photo editor software often says ppi, while scanner software generally says dpi (but there are exceptions to both, due to preferences). But either term is correct, and in fact, the name for image resolution has always been dpi, for many years before inkjet printers could print photo images. So you will often see either dpi or ppi used, and you must understand both as the same term. It may be a bit confusing at first, but that's simply how things are. Think of this as training to understand what you will see elsewhere. <grin>

There is no problem understanding the two uses of the word dpi if you know the basics, and realize the context. **It always means the only thing it can mean** in context. This should be no

multiple context definitions.

If the usage context pertains to images or printing pixels (and it almost always does), then dpi always means "pixels per inch". So does ppi, same thing exactly. The two terms are fully interchangeable, use either according to your whim. If we have a 300 dpi image, both terms mean it will print at 300 pixels per inch (pixel spacing on paper), so 300 pixels will cover one inch.

If the usage context pertains to inkjet printer ink dot ratings, dpi means "ink dots per inch" (but since the ink dots are actually larger than their spacing, the rating is more specifically about carriage and paper motor stepping intervals). If the printer rating is 1440 dpi, it means its motors can space 1440 ink dots per inch while trying to simulate the color of the pixels in that 300 dpi image.

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## **Romeo and Juliet: The Life and Times of William Shakespeare (Featuring Scanning)**

**OBJECTIVE:** Students will realize that Shakespeare was a product of his time, his background, and his opportunities -- that without those, his plays would not have been written the way they were. Students will:

- illustrate what they know of Shakespeare (through research)
- describe his life, his works, and his time

**INSTRUCTIONAL CONTENT:** Before Reading: Setting development

**TEKS CONNECTIONS:**

Language Arts 6, 7, 8: 6.10 (B), 7.10 (B), 8.10 (B), 6.13, 7.13, 8.13, 6.24 (A), 7.24 (A), 8.24 (A)

English I 7, 16, 17, 20 (A), 20 (B), 20 (C)

English II 7, 16, 17, 20 (A), 20 (B), 20 (C)

English III 7, 15, 16, 20 (A), 20 (B), 20 (C)

English IV 8, 16, 17, 20 (A), 20 (B), 20 (C)

**INSTRUCTIONAL MATERIAL:**

- Journal (one for each student)
- *Romeo and Juliet* text
- Magazines and books with pictures of the Elizabethan age
- Computer with PowerPoint

**INSTRUCTIONAL DELIVERY:**

1. When we talk about Shakespeare, we have to take into account the world and time period he lived in, particularly the fact that:
  - he was born at a fortunate moment in the history of English as a developing language, when print had for the first time made the recording of speech easily available.
  - the first professional theaters had also opened when Shakespeare was in his teens, and by the time he was an adult they were strongly established.
  - most of Shakespeare's plays were taken from published histories or tales in Shakespeare's time.
  
2. Divide students into groups of two or three. Select four groups to pick one of the following and research it. They will be expected to give a 5 to 7-minute oral and PowerPoint presentation. The presentation must include pictures that have been scanned and inserted into slides. How would the historical places, events, or person have shaped Shakespeare's life?
  - Queen Elizabeth I
  - London in 1585-1600

- Elizabethan Theatre
  - The King's Men
3. Have remaining groups select one of the following topics and research and explain (in an oral and PowerPoint presentation that includes inserted scanned pictures) one of the following aspects of the Elizabethan age:
    - Home life
    - Trade and commerce
    - Food and clothing
    - Education
    - The market town
    - Health and medicine
  4. Brainstorm with the whole class a series of questions concerning each topic. These questions will form the basis of the students' research. Then have the students break into their groups to formulate additional questions and identify resources they can find to help answer the questions. Ensure that students know to select resources that have pictures.
  5. In their journals, have students document their research and create notes for use during the oral presentation.
  6. Tell your students (or review with them) how pictures can be scanned from books and magazines and inserted into PowerPoint presentations. If the pictures are to be used beyond the classroom, ensure that permission is received.

### **EVALUATION:**

Collect student journals.

Q: Were the students able to get the information they needed?

Q: Was the information readily accessible?

Q: Were the students able to generate relevant questions?

Q: Did the students have a sense of what to look for?

Q: Did the students find books and magazines and scan pictures?

Q: Are students using the journals to create presentation notes?

Consider the oral and PowerPoint presentations.

Q: Do students' PowerPoint presentations contain pictures that are relevant to the topic?

Q: Are pictures of sufficient quality to serve the intended purpose?

Q: Did all students participate in the creation of the PowerPoint presentation?

Q: Did all students participate in the oral presentation?

(Adapted from <[http://www.geocities.com/trichard\\_ca/](http://www.geocities.com/trichard_ca/)>

"Welcome to my web page on Romeo and Juliet. The Unit Plan, Lessons and Activities are free for you to use. I have accumulated them over the years and to the best of my knowledge -- are mine. I hope to add a critical thinking quest for students very soon." <[http://www.geocities.com/trichard\\_ca/](http://www.geocities.com/trichard_ca/)>)