3

Create and Use Images

IMAGES CAN ENLIVEN projects of all types by adding dimension and immediacy to everyday and academic communications. Digital technologies make this visual communication easier than ever. *Meaningful* visual communication, however, can be a challenge. Too often, images are an afterthought in a project and end up detracting from, rather than enhancing, the ideas and information being presented. Images can even work against the goals of a project, complicating rather than clarifying meanings.

In this chapter we share several approaches you can use to ensure that your visual communications are effective and meaningful. Align your visuals and project goals by knowing how images function to convey information and by using a rhetorical approach to image use. Achieve visual impact through an awareness of visual design principles and just the right amount of technical knowledge. Practice editing and creating visual materials to build your confidence and competence.

ACTIVITIES IN THIS CHAPTER

Foundational Questions

What Role Will Images Play in My Project?

Before you incorporate an image, spend some time thinking about the role that visuals will play. What ideas or information

Visual Literacy for Libraries: A Practical, Standards-Based Guide by Nicole E. Brown, Kaila Bussert, Denise Hattwig, and Ann Medaille (Chicago: American Library Association, 2016).

are you trying to communicate? Are you creating images to convey a concept or to make an argument? Will your visuals serve to illustrate a process or point, or will they be decorative? Are you representing data graphically to tell a story? Now imagine your audience and align the visual content with the purpose of your project. Your answers to these questions will help you determine whether you will need to create a new image or use an existing one.

What Design Strategies Will I Use?

Creating useful visuals and using images effectively involve design strategies and a healthy dose of creativity. Think about the visual style of your project—is it serious, jaunty, moving, funny, or factual? What emotions do you want to evoke in your audience, if any? What do you want your audience to learn or consider by way of the images you're using? Thinking through these issues helps you to make intentional and meaningful aesthetic choices to communicate your message.

What Tools and Technologies Will Be Helpful?

Whether you are creating an image yourself or incorporating existing visual materials into your work, there are many tools and technologies to help you through the process. Experimenting with these image-production tools, and developing a level of proficiency with them, will help you create and adapt images to suit your purposes.

Are My Visuals Good? Could They Be Better?

Taking a step back to evaluate the visual products you create and the effect of the images you use is an essential part of the visual communication process. You'll want to assess your visuals to determine whether they meet your project goals. If the project is scholarly, you'll want to be sure that the visuals follow your discipline's conventions. After all, visual materials contribute to research, learning, and communication in most fields. Before revising your work, you can apply strategies for checking in with others to assess the effectiveness of your visual products.

The Power of Images

We've all heard the adage "A picture is worth a thousand words." Though not literally true, the saying captures the fact that imagery conveys meaning and information differently than language. It turns out that images are uniquely powerful because of the way the human brain processes visual information.

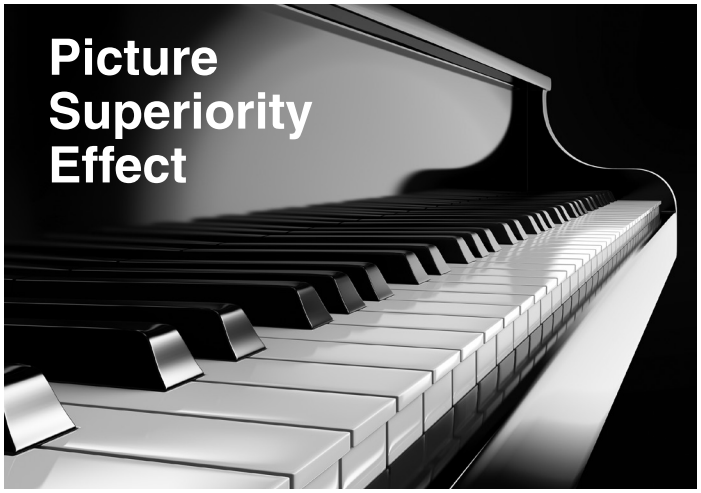


Figure 3.1.
Picture superiority effect

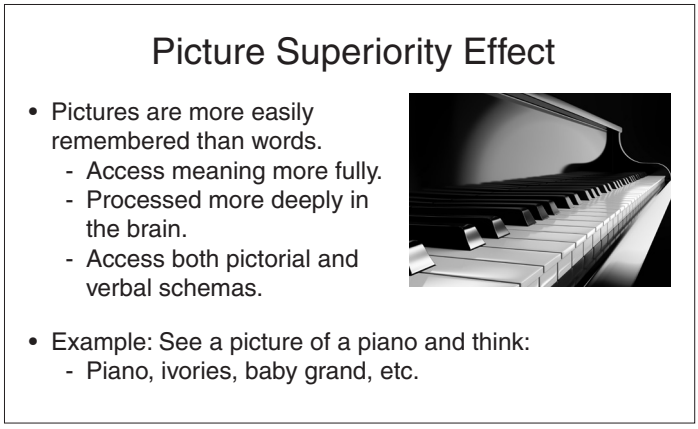
Memory experiments by cognitive psychologist Allan Paivio demonstrated that pictures are remembered better than words, a finding called the *picture superiority effect*. Paivio concluded that pictures access meaning more fully than words and are processed more deeply in the brain.

When you look at an image of a piano, for example, your brain is processing the information (perceiving, understanding, and remembering) by accessing two systems or channels—verbal and visual. You recognize the image and call up the words *piano* and *ivory* and *keys*. However, if you read or hear the word *piano,* you access only the verbal system. Of course, you can create a mental image of a piano without an accompanying picture, but the picture superiority effect still means that you will remember the word and meaning better if an image is conjured in your mind's eye, and providing an image helps the brain do that work.

This is not to say that we should ditch all text from our PowerPoint slides and library guides. Psychologist Richard Mayer's (2009) research on multimedia learning found that the visual and verbal channels complement each other. When pictures and words are integrated, as in figure 3.1, learners are able to construct a deeper understanding than if presented with words or pictures alone. The main takeaway is to think about how you can use visuals to amplify your messages across a wide range of contexts—whether it's a poster, a handout, or a classroom lesson.

Figure 3.2.
A typical slide combining text and image

Consider figure 3.2, which depicts a typical slide layout with text in bullet points accompanied by a small image. This slide essentially negates the picture superiority effect. Like figure 3.1, it contains a combination of image and text, but there is so much text that it overwhelms the viewer's perception of the image and encourages reading rather than listening or looking. No matter what a presenter might be saying when the slide is shown, if you're in the audience, you're probably just reading the words, and you're reading them faster than any presenter could



ever deliver the content. You're likely not fully listening to what is being said or even really seeing the picture.

In *Presentation Zen,* communication expert Garr Reynolds dubs the tendency to include too much information on a slide *slideumentation,* a term he coined by combining *slide* with *documentation.* Reynolds urges presenters to avoid conflating visual aids with lengthy textual descriptions; he suggests that speakers think of presentations in three distinct pieces: visuals, speaker notes, and handouts for material the audience can read later (Reynolds 2008). Next time you create a visual product, ask: "What information or ideas am I representing with the written word that I could represent visually instead?" The answer just might surprise you. Use **Activity 3.2: Amplifying a Message with Visuals** to practice presenting information with images instead of text.

Aligning Image Use and Purpose

There are many ways to communicate with images: from providing illustration and decoration to presenting complex data with charts, graphs, and other visualizations. Images can be used as symbols to represent concepts or to provide visual cues or prompts that influence behavior or call for action.

When you are planning for image use, your purpose and context inform your message and design choices. Analyze the rhetorical situation to ensure that your image use aligns with your overall project goals. The Aristotelian concepts of *ethos, pathos,* and *logos* comprise the rhetorical triangle (figure 3.3), and taking the time to think through these concepts will guide your visual communication.

- Ethos—Depiction of character
  Ask: How am I portraying myself as the *author* or *creator*?
- Pathos—Emotional style or treatment
  Ask: Does my creation appeal to my *audience*?
- Logos—Discourse and reason
  Ask: Are the structure and content of my *message* strong?

Figure 3.3. *The rhetorical triangle*

The rhetorical triangle aligns your content with your project goals and context. You might be surprised by how much a few simple questions can clar-

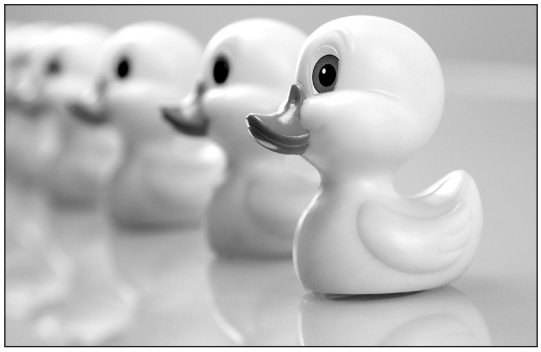


Figure 3.4.
Ducks in a row

ify and improve your message. Let's think through an example.

Imagine that Molly A. Librarian is planning a workshop for a group of new faculty about citation management tools. She wants to express the benefits of these tools in a fun and engaging way, and the first thing that comes to mind is "getting your ducks in a row," so she searches for an image of ducks and finds a high-quality image of a line of rubber duckies called "Concept of Organization with Ducks in a Row." She uses the image as the opening slide for her presentation (figure 3.4).

Perfect, right?

Not so fast. Working this way helps capture ideas, but it's worth the extra step of thinking through what the image is communicating. Let's run through the questions for ethos, pathos, and logos for this scenario.

- *Ethos*—How is the author or creator portraying herself?

  Although Molly intends this image as lighthearted and fun, it may not help her to present herself as a serious professional, potentially undermining her credibility with her audience. She could unintentionally be presenting herself as uninformed about the nature of faculty work, potentially alienating those whom she is trying to reach.

- P*athos*—Does the creation appeal to the audience?

  Although this image is appealing as a visual of rubber ducks, it may not make sense to the new faculty members who are attending Molly's workshop to learn to use a citation management tool. There is a risk that they will find the image juvenile and disconnected from their experience as accomplished researchers. There is also the possibility that they may not be familiar with the phrase "ducks in a row," so the underlying idiom and its meaning would be lost.

- *Logos*—Are the structure and content of the message strong?

  Molly's overall workshop goal is to communicate the importance of organizing research to new professors at her institution. This image choice does not align with that message. It also relies on a narrow and culturally specific use of language and could unintentionally alienate learners with diverse life experiences.

What can Molly A. Librarian do? She can reexamine her purpose and context and come up with a better idea. Molly wants to portray herself as a serious

librarian with a sense of humor who knows a thing or two about citation management. She plans to appeal to the emotion of the new faculty by convincing them that there is a better way to organize their research process. She hopes to communicate clearly and effectively with every individual attending the workshop. Perhaps a desk covered in documents waiting to be filed will grab the audience's attention and include all learners, while still letting Molly's personality shine through. Searching for "messy desk" uncovers gems such as figure 3.5 that will better suit this workshop.

Figure 3.5.
Pile of documents

The preceding example illustrates the importance of keeping your specific circumstances in mind when using images and being flexible enough to pivot when your first image choice fails to meet your goals. Idioms, wordplay, homonyms, and colloquialisms do not always translate well into visual representations, and they need to be used with caution. At their worst, attempts at clever image use can create confusion and detract from the learning experience. Learners bring diverse life circumstances and experiences to the classroom, and you can use ethos, pathos, and logos to ensure that your images are inclusive. Knowing your audience also alerts you to situations in which you need textual equivalents and different types of images to reach all learners. Student work is often rooted in a disciplinary context, and **Activity 3.1: Exploring Disciplinary Image Use** identifies ways that images are used within a discipline and applies this knowledge to inform an upcoming project.

Designing and Making Images

If asked to come up with a synonym for *design,* you might say *creativity.* Indeed, design requires creativity, but they are not the same thing. The good news is that creativity can be learned. David Kelley, founder of IDEO, a leader in the user-centered design of products, services, and environments, wrote *Creative Confidence* with his brother, Tom. The Kelley brothers' premise is that "creativity is something you practice, not just a talent you're born with" (Kelley and Kelley 2013). The International Center for Studies in Creativity at Buffalo State University supports this view of creativity and defines it as "the production of original ideas that serve a purpose."

DESIGN BASICS

You can exercise your creativity by learning about and employing the basic design strategies covered in this section, including color, texture, shape, typography, contrast, repetition, alignment, and composition. These design concepts help you and your students to think about the formal elements of images and how they impact the delivery, interpretation, and meaning of visual information. There are also many great resources to help build your confidence in this area—see our list of **Favorite Books on Design and Visual Communication** for suggestions.

Color

Color is the combination of *hue* (e.g., red, yellow, and blue), *intensity* (brightness or dullness), and *value* (lightness or darkness). The color wheel, comprising twelve colors, helps designers choose color schemes that work together. The points of the triangles in the center of figure 3.6 show two triads: yellow/blue/red and green/violet/orange.

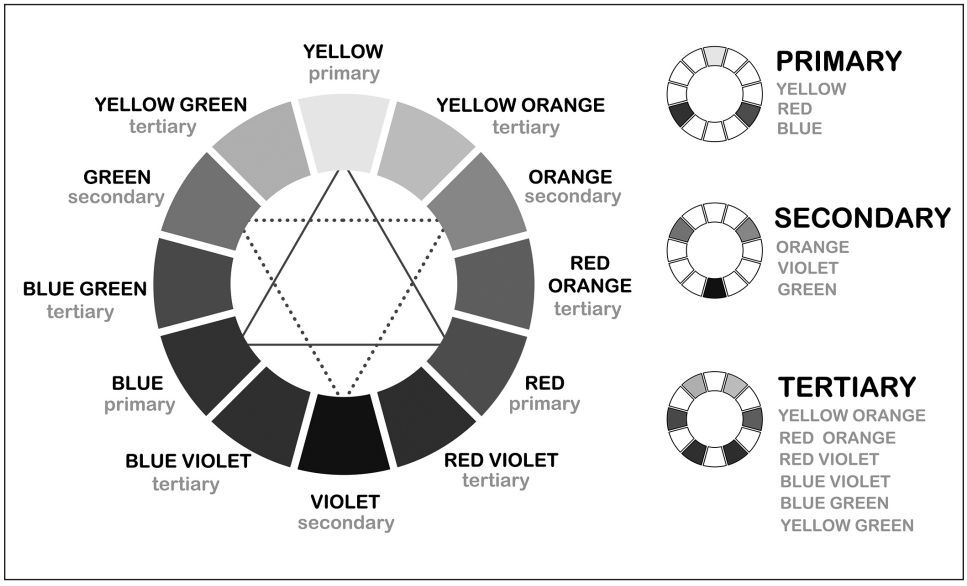


Figure 3.6. *Color wheel*

Basic Principles

- There are three *primary* colors: yellow, red, and blue.
- *Secondary* colors combine two primary colors: they are orange, violet, and green.
- *Tertiary* colors combine a primary and a secondary color: they are yellow orange, red orange, red violet, blue violet, blue green, and yellow green.

Colors and Culture

Aesthetic elements such as color, line, shape, and texture play a significant role in the suggestive or associative meanings that a viewer perceives from an image. Color may suggest feelings, such as anger or happiness, or ideas, such as power or strength.

Color has different meanings and evokes different feelings and emotions across cultures. A study conducted by Dr. Ralph B. Hupka, a specialist in the psychology of emotion at California State University, Long Beach, and a cross-cultural team of researchers gives us a glimpse into varied associations with color (Hupka et al. 1997). The team looked at the emotional impact of color across five countries—the United States, Germany, Mexico, Poland, and Russia. The researchers looked at color associations with four emotions: anger, envy, fear, and jealousy. The results suggest that the emotions associated with color have a strong cultural component. Although all countries in the sample associated black with anger and fear, and red with anger and jealousy, there was great variation with associations of purple, green, and yellow.

Other researchers' work also supports the finding that color associations vary across cultures. Writing from a marketing and communication perspective, Mubeen Aslam points out that white is often associated with purity in Western cultures but with death and mourning in some Eastern cultures (Aslam 2006). Arianne Jennifer Rourke and Zena O'Connor, design researchers from the Universities of Sydney and New South Wales, observe that color associations vary not only across cultures but also within the contexts in which they are used. The color red, for example, is often used in conjunction with revolutionary ideas. Communism and socialism have often been represented by a red star. Red is also used to represent dangerous situations, as indicated by stop signs and danger signs (Rourke and O'Connor 2012).

- *Complementary* colors are directly opposite each other on the color wheel and provide high contrast (e.g., yellow and violet).
- *Analogous* colors are groups of three adjacent colors on the color wheel (e.g., yellow green, green, and blue green).
- A *triad* is composed of any three colors that form a triangle on the color wheel (e.g., green, orange, and violet). Using a triad to compose a palette can create well-balanced, bold combinations.
- A *monochromatic* palette consists of one color varied in intensity from light to dark.

COFFEE BREAK!

Experiment with Color

What are your institution's colors?

Use these colors as a starting point to create a complementary, analogous, triad, and monochromatic palette.

Use *Color Picker* and *Color Mixer* from W3Schools to try out different colors and color combinations. These tools also will give you the hex codes to use the colors in Web environments.

Texture

Texture is the perceived surface quality of a design. Together, the rough and smooth rocks in figure 3.7 provide contrast and visual interest.

Figure 3.7. *Smooth and rough textures*

Basic Principles

- Texture may be rough, smooth, soft, shiny, or some other quality.
- Texture can create a distinctive feeling within a design.
- Texture can be used to create and maintain interest.

Put It into Practice

- Use a texture as a background for a presentation. How does the texture change the feel?
- Enhance a photograph by changing the texture. What impact does this change have?

Shape

Shape is the area that is outlined within a design. The well-known figure-ground illusion known as the "Rubin vase" or "Rubin face-vase," shown in figure 3.8, plays with shape and helps to explain the concept of negative space.

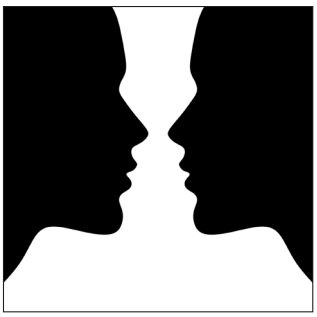


Figure 3.8. *Positive and negative space*

Basic Principles

- Shapes can be geometric or organic.
- Shapes can be *positive* or *negative* depending on how they are used. Positive shapes are in the foreground, while negative shapes are in the background.
- Silhouettes are useful for understanding where positive and negative spaces lie.

Favorite Books on Design and Visual Communication

Beautiful Evidence by Edward R. Tufte (2006)

Design Principles by Richard Poulin (2011)

Graphic Design: The New Basics by Ellen Lupton and Jennifer Cole Phillips (2015)

The Language of Graphic Design by Richard Poulin (2011)

The Non-Designer's Design Book by Robin Williams (2008)

Presentation Zen by Garr Reynolds (2008)

slide:ology by Nancy Duarte (2008)

Thinking with Type by Ellen Lupton (2010)

- The lines that distinguish shapes serve to set them off from the rest of the design.
- Shapes can be differentiated through color, texture, or use of light and dark.
- Shapes may be used in different combinations to direct the viewer's focus.

Put It into Practice

- Look at a book jacket or a poster and identify the positive and negative spaces.
- Use shape as a signature design element. A solid shape rendered in different sizes or colors can provide a unifying yet attention-grabbing visual theme.
- Trace the outlines of shapes in an advertisement, then step back and notice how the design uses shapes and space.

Typography

Typography is the arrangement and style of lettering within a design. The text in figure 3.9 shows serif fonts, which have little lines at the ends of the strokes (*serifs*) that comprise the letter, and sans serif fonts, which do not have serifs.

Figure 3.9. *Serif and sans serif fonts*

Basic Principles

- The choice of type should generally maximize readability in terms of size, spacing, and contrast. Remember that fonts must, first and foremost, be readable.

- Fonts may be *serif* (having small lines attached to the ends of letters) or *sans serif* (without these lines).
- There are no hard-and-fast rules for when to use serif or sans serif fonts, but some designers suggest using serif for text in print and sans serif for large, multimedia text. Most e-readers seem to adhere to this maxim, and Amazon's Bookerly font is a good example.
- Fonts can be combined for impact and visual interest, but be aware that using three or more different fonts within a single design can be distracting, as can the use of overly fancy or cartoonish fonts.
- Typography has a long and rich history, and font choice is an important part of a design strategy. It affects the overall style and meaning of your visual presentation.

Put It into Practice

- Does your institution use a specific font? If you're not sure, check with your institution's office of communications. Is it serif or sans serif? Are there guidelines for this font's usage? Can you find a font that complements it?
- Experiment with writing the same message in different fonts. Your message may take on different meanings or evoke particular styles or periods depending on the font you use.

Figure 3.10.
Contrast

Contrast

Contrast is the juxtaposition of different elements within a design. Contrast adds visual interest and creates emphasis. The color, shape, and texture of the half apple in figure 3.10 contrast with those of the other apples.

Basic Principles

- Contrast may be created using many different elements, such as color, type, texture, line thickness, and shape.
- Contrast can be used to highlight elements in an image, to create interest, and to show the viewer what is most important.
- When used with type, contrast emphasizes words or phrases.

Put It into Practice

- Look at an advertisement. How is contrast used to emphasize the message?
- Open a slide that contains two different objects, images, or pieces of text. Experiment with various ways to make these items as different as possible. Make bold choices.

Repetition

Repetition is the use of similar elements within a design. In figure 3.11, the repeated cup shape creates consistency and unity within the design while allowing the viewer to quickly discern the differences among the thirty-two types of coffee drinks.

Figure 3.11. *Repetition of coffee types*

Basic Principles

- Repetition creates unity within an image and helps to make information easier for the viewer to interpret.
- Repetition makes it easy for the viewer to quickly discern the differences among different types.
- Elements such as colors, shapes, lines, fonts, and objects can be repeated throughout a design.
- Too much variation can be distracting and can make it difficult to guide the focus of the viewer.

Alignment

Alignment is the placement of elements so as to create lines within a design. The text and images in figure 3.12 are center-aligned along three invisible vertical lines and three invisible horizontal lines. The alignment creates strong organization within the piece, showing the unity that exists among the nine different innovation activities. Alignment makes the image more visually appealing and makes the information easier to interpret.

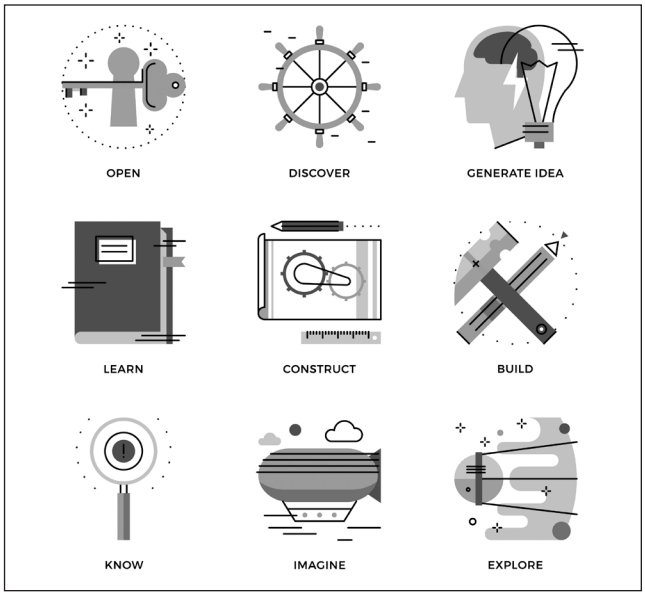


Figure 3.12. *Alignment among innovation activities*

Basic Principles

- Alignment helps to clarify the organization of elements within a design.
- Consistent alignment creates organization among different elements.
- Lines may be visible or invisible. Even when there are no visible lines in an image, the placement of items

COFFEE BREAK!

Practice Repetition and Alignment

Pull up an old slide presentation (or use a Creative Commons–licensed presentation).

REPETITION

Identify the elements that are repeated. Consider headings, bullet points, icons, colors, and images. How do these elements affect how you view the presentation?

Now try repeating an element such as an image, shape, or text feature throughout the entire presentation. What effect does this repetition create?

ALIGNMENT

Experiment with moving everything to the left, right, and center. What happens?

Now line everything up on one or two strong lines. How do these changes affect how you view the slide?

in relation to each other creates alignment, making the information easier to interpret.

Put It into Practice

- Explore a restaurant menu. Pull a takeout menu from your desk drawer, or find an image of one online. Examine the alignment. Is text aligned to the left, to the right, or in the center? Or are several alignments in use? How does alignment affect the menu's readability?

Composition

Composition is the arrangement of elements within a design. The "rule of thirds" is a composition technique that uses two horizontal and two vertical lines to divide an image and inform the layout. Figure 3.13 illustrates this rule: The fisherman's head and waist are located at two of the intersections, with his body following one of the lines. The horizon follows another line, and the trees on the horizon are close to a third intersection. Even though the subject of the image is off center, the photograph appears balanced and feels natural.

Figure 3.13. *Rule of thirds*

Basic Principles

- A grid based on the rule of thirds helps to achieve balance and emphasis in a composition.
- Grouping items together helps to organize content, making it easier to interpret.
- Placing objects close together can suggest that they are related, while placing objects far apart may suggest that they are different.
- White space, or negative space, is an important part of overall composition: don't be afraid of it!

Put It into Practice

- Take several photos of the same subject and use the rule of thirds to practice putting your subject in different parts of the image. What happens when you place your subject in the center? What happens when you use the rule of thirds and place your subject along one of the lines or at an intersection of the lines?
- Put a piece of tracing paper over an advertisement and draw an evenly spaced grid over the ad. Now trace the figures in the advertisement. What do you notice about the use of white space? Do you see the rule of thirds at work?
- Use the rule of thirds to inform your design by imagining grid lines (or drawing them in) the next time you create a handout or slide presentation.

Design Tips for Visualizing Data

In chapter 1, "Interpret and Analyze Images," we discussed the characteristics of graphics and questions to consider when reading them. On the flipside is the ability to know how to visually represent the data you have. Here we present a few best practices to keep in mind once you have chosen a format to visualize your data. Consult **More to Explore: Visualizing Data** in chapter 1 to dive deeper. In **Activity 3.4: Creating Graphical Representations of Data,** students will practice grappling with these design choices.

EXPLORE AND CHOOSE FORMAT

The nature of your data and your communication goal should guide your choice of format or chart type. For example, time series data are well presented as a line chart. It is also useful to explore variations because some visualizations emphasize certain aspects of the data in different ways. Once you have chosen a format, you will encounter a new series of design choices and considerations.

ARRANGE ELEMENTS DELIBERATELY

Be purposeful about positioning and emphasizing elements to focus your viewer's attention on the most important aspects of the data. The nature of the data should guide a logical organization (e.g., by time period, alphabetically, by frequency, etc.) and layout (e.g., proportion, scale, aspect ratio, etc.) for a readable and statistically accurate display. For instance, a bar chart can be arranged from highest to lowest, which gives viewers a quick comparative summary, rather than arranged randomly, which is visually unhelpful. Close placement of text with its associated data speeds up comprehension: whenever possible place labels near the data instead of in a legend; if a legend is necessary, put it near the data it represents.

PROVIDE EXPLANATION WITH TEXT

Give your audience the necessary information, and don't assume viewers know what everything in the graphic means. Make sure you label the data, axes, and units concisely, and include proper citation for external data sources. Use fonts that are simple and legible. The typography should support, not distract from, the data.

USE COLOR WISELY

Color is used for differentiating labels, distinguishing values, and creating an engaging and effective visualization. Color should be applied intentionally to communicate your message and to improve the readability of the graphic. Use the following guidelines.

Continued on page 80

Design Tips for Visualizing Data *(continued)*

- *Choose a color scheme:* Select an appropriate color palette and use it consistently. ColorBrewer 2.0 is a color picker designed for mapping, but it also works for other visualizations.
- *Make colors accessible:* Keep color-blind viewers (5 to 10 percent of the population) in mind and avoid color combinations such as red/green and blue/yellow. Simulator programs are available to check for color blindness. Color should not be the sole way to differentiate items.
- *Highlight and order data:* A change of color or contrast signifies a change or addition in the data. For presentation purposes, use one or two colors for emphasizing data and patterns, and use color-coding for organization and hierarchy.
- *Consider meaning:* Does your color scheme create a feeling or meaning that relates to your data, or does it confuse your viewer? A gray scale can effectively differentiate categories, whereas colors often generate what Edward Tufte (2001) terms "graphical puzzles" because the rainbow spectrum doesn't readily or naturally render a meaningful visual order. For some types of data though, physically and culturally resonant colors may aid readability, such as green for apples and blue for blueberries in a graphic depicting fruit sales (Lin et al. 2013). The bottom line is that color should add visual clarity.

TELL THE TRUTH WITH YOUR DATA

Some charts bring with them certain pitfalls to watch out for. When creating charts, keep the following guidelines in mind.

- *Apply the "start at zero rule":* In bar charts the *y*-axis must start at zero, otherwise the visual difference between values can be overemphasized. Breaking this rule can make a minor change look more meaningful than it really is. Although line charts don't need to start at zero, take care to choose an appropriate *y*-axis scale and increments so as not to exaggerate or minimize the trend.
- *Consider the suitable aspect ratio:* In some charts, such as line charts, the same data can look different depending on the aspect ratio of the chart. But how do you know what aspect ratio is appropriate for your data? In photographs you can see clearly whether the aspect ratio is being stretched or squished, but in charts and graphs such distortion is less obvious. One best practice—though not a hard-and-fast rule—is for the average slope in a line chart to be 45 degrees, known as "banking to 45 degrees" (Cleveland, McGill, and McGill 1988). This practice creates a chart that is "standard" and easier to interpret clearly.

TECHNOLOGY AND IMAGES

When creating and using images, knowing about design principles is just one piece of the puzzle. You also need to be able to put the design principles into practice. Fortunately, many tools and technologies are available for creating and adapting images. Tools and best practices are constantly changing, so make experimentation and a regular reading of technology reviews and blogs standard parts of your professional development practices.

The key to choosing and using technology effectively is to articulate what you need to *do* with it. In this section, we lay out some core vocabulary related to editing and formatting images. These terms are common to image-manipulation tools from Photoshop to Paint, web-based tools, and even your mobile phone. When you're comfortable with image manipulation vocabulary, you'll easily find the right tool for the job by conducting a simple web search or by exploring the tools in standard software packages. Try **Activity 3.5: Editing Images** to give students an opportunity to experiment with image editing and to discuss changes that image manipulation can make to appearance, design, and meaning. Use the **Image Editing Basics** chart and corresponding **Coffee Break!** to practice editing techniques.

Image Editing Basics

TERM	DEFINITION
Blur	Soften the focus of the image so that it appears indistinct or fuzzy
Contrast	Difference between the amount of light and dark in an image
Crop	Cut out portions of an image
Filter	Overlay or effect applied to an image that changes its color or style
Outlines and borders	Lines drawn around items within an image or around a whole image
Recolor	Change colors within an image or adjust the degree of color saturation
Reformat	Convert an image to a different file format (e.g., jpeg, png)
Resize	Make an image smaller or larger
Rotate	Change the orientation or alignment of an image
Shadow	Effect that gives the appearance of depth or three-dimensionality
Transparency	Adjustment of part or all of an image so that light passes through

A digital image is an encoded data file. The image formatting specifications are contained within the data, including a description of the properties of the image, such as the size and resolution. When you are working with a digital image, it helps to understand basic formatting terminology to describe image specifications, such as those shown in the **Image Formatting Basics** chart.

Image Formatting Basics

TERM	DEFINITION
Aspect ratio	The ratio of width to height of an image expressed as width:height—for example, 4:3 (traditional); 16:9 (widescreen).
Color codes	There are two models for communicating colors: RGB and CMYK. RGB, used in computing, combines red (R), green (G), and blue (B) light to produce a broad array of colors. The RGB level of each color is expressed as a value between 0 and 255 (e.g., pink is 255,192,203, which equates to a hex code of FFC0CB). The CMYK color system, used in the print industry, uses cyan (C), magenta (M), yellow (Y), and black (K) to produce different ink shades. Values are represented with percentages (e.g., pink is C = 0%, M = 24.71%, Y = 20.39%, and K = 0%).
Dimensions	The height and width of an image, measured in pixels, inches, or centimeters. Also referred to as "image size."
File format	The format in which data is stored; common image file formats include jpg, jpeg, gif, png, and tiff. Each of these formats has a specified organization of the data within the file. Different file formats are preferable for different situations. For instance, jpeg is considered "lossy," meaning its integrity can be compromised through use and over time, whereas tiff is an archival and preservation format.
File size	The size of a digital image file, usually measured in kilobytes (KB) or megabytes (MB).
Resolution	The density or amount of detail in a digital image, often measured in ppi (pixels per inch). Higher resolution images include more detail and are sharper.

You will need different image sizes, formats, and resolutions, depending on how and where you will be using your image. Our **Image Formats and Resolutions for Common Uses** chart provides some general guidelines for aligning image specifications with common tasks and image uses. Keep the following technical best practices in mind when editing image specifications:

COFFEE BREAK!

Edit an Image

Choose an image and open the editing tool of your choice. Experiment with as many of the following edits as you can.

Blur	Outlines and borders	Rotate
Contrast	Recolor	Shadow
Crop	Reformat	Transparency
Filter	Resize	

Which edits might you apply in your own work?

- *Create or download the highest quality image file*. Images can always be made smaller or compressed. If you anticipate that you will need a large image (for print or detailed display, archival preservation, etc.), download or create the largest possible image file, then resize it as needed.
- *Retain a master*. Keep an unedited original version of your image so you can start over if you make a mistake during the editing process.
- *Resize first*. Resize your image in an image editing tool before inserting the image into presentation software or uploading it to a website, blog, and the like. If you insert an image into a software tool or online environment before resizing, the result might be an unexpected display size or overly large file size, which could impact download speed.
- *Don't "upsize."* Consider the image's original size and resolution to be the maximum. Do not "upsize," or make larger, a new digital image from a smaller digital image. This will result in a blurry or pixelated image.
- *Be mindful of "downsizing."* Making a smaller image from a large image and then saving it loses the larger dimensions and resolution of the original image, and you will lose quality if you make the image larger again.
- *Maintain the aspect ratio*. Always retain the original aspect ratio when resizing images. Changing the aspect ratio will distort the image. Crop, rather than resize, if you need to edit an image to specific dimensions.

Image Formats and Resolutions for Common Uses

Note that dimensions and resolutions are approximate and should be considered starting points.

USE OR ENVIRONMENT	FILE FORMAT	DIMENSIONS (SIZE, IN PIXELS) AND RESOLUTION (PPI)	EXPLANATIONS AND RECOMMENDATIONS
Presentation	jpeg	*Dimensions:* 1024x768 or 1280x960 (full-screen, 4:3 ratio, XGA projector) 1920x1080 (full-screen, 16:9 ratio, HD projector) ***Resolution:*** 72 or 96 ppi	Projector capabilities determine optimal image presentation size. XGA projectors are most common in academic and conference venues and project 4:3 ratio images. If you are using full-screen images, plan to use 4:3 ratio images to avoid image distortion, unless you are able to confirm 16:9 HD projection is available. Smaller images can be any size or ratio.
Blog post	jpeg	*Dimensions:* 160x120 (thumbnail) 300x225 (small) 660x495 (medium) 1024x768 (large) 1280x960 (full) ***Resolution:*** 72 or 96 ppi	Choose image dimensions for blog posts based on your purpose and desired effect. Experiment to determine which sizes work best for you. Screen display resolution is typically maximized at 72 ppi, although 96 ppi is becoming more common. Resolutions higher than 96 ppi do not provide greater on-screen clarity.
Website	jpeg	*Dimensions:* 1024x768 to 1280x960 (full-screen background image) ***Resolution:*** 72 or 96 ppi	Computer screen resolutions vary considerably. W3Schools reports that 97 percent of their site visitors have a screen resolution 1024+768 pixels or higher. If you want to display a full-screen image without scrolling for most users, aim for 1024+768.
Online research guide	jpeg	*Dimensions:* 300x225 (small) 660x495 (medium) ***Resolution:*** 72 or 96 ppi	Small or medium-sized images are recommended for research guides because they are easily visible but do not occupy an inordinate amount of screen space.
Print poster	jpeg	*Dimensions:* Varied, depending on your design and project purpose. ***Resolution:*** 300 dpi will produce the sharpest print images	Make sure your images are large enough to be easily visible. Generally, images should not be smaller than 300+225 on print posters.
Screenshot	jpeg, png, or gif	*Dimensions:* Varied, depending on the screen area you capture ***Resolution:*** Will be the same as the native resolution of your screen, so 72 or 96 ppi	Choose jpeg for the smallest screenshot file size. The png format renders text, color, and web graphics more clearly than jpeg, but yields a larger file size. Use gif for animations.
Master archival scan of print materials	tiff	*Dimensions:* Varied, depending on the size of the print original ***Resolution:*** Scan to 600 ppi	Consult your library's guidelines for archival and preservation scanning. Different formats (35 mm slides, print photographs, newspapers) require different settings.

COFFEE BREAK!

Explore Image Formatting

Choose an image, and find out as many of these formatting details as you can.

Dimensions: _____

Resolution (in ppi): _____

File format: _____

File size: _____

How might you apply this information in your work?

_____

_____

PRACTICE MAKING

A key part of Kelley and Kelley's definition of creativity is "practice" (2013). Pradeep Sharma, former dean of Architecture + Design at the Rhode Island School of Design and now provost, says that design *is* a practice, which "implies two things: first, that we have to do something in order to understand it; and second, that we get better the more we do it" (Somerson and Hermano 2013). Understanding how design works requires doing it. The more you practice design and make visual products, the more you will experience how design communicates through visual forms, creates meaning, and tells stories. And, of course, your visual communications will become sharper.

Getting started with a *practice* of making visuals can feel like a hurdle, even to seasoned artists and designers. Clara Lieu, visual artist, notes in her "Ask the Art Professor" column in the Huffington Post in 2014 that grand ideas and ambitions for significant projects can create a barrier to doing anything at all. She suggests, "Instead of embarking on some huge project, start a series of daily exercises for at least one month." This strategy of small daily practice can work well for anyone wanting to venture into making of any kind. Try using one of this chapter's "Put It into Practice" features or "Coffee Breaks" each day for a week to build your experience and comfort with making. Storyboarding is another way of thinking through a visual project by breaking it down into smaller parts. Use **Activity 3.3: Storyboarding** to practice this technique with students.

The process of making can also be the goal of the activity. Critical making is an approach to solving problems that uses the physical act of manipulating tactile materials or technology in order to work through questions or interrogate sites of confusion or conflict. Matt Ratto, associate professor in the Faculty of Information at the University of Toronto, coined the term *critical making* in 2008 as a convergence of critical thinking and making practices. He defines critical making as "a series of processes that attempt to connect humanistic practices of conceptual and scholarly exploration to design methodologies including storyboarding, brainstorming and bodystorming, and prototyping" (Abel et al. 2011). Making something visual can be an effective way to think through a complex topic or vexing problem and can lead to a critical-visual approach to a research question.

As libraries increasingly engage with making activities, some are developing makerspaces complete with tools, software, and participatory learning opportunities. Visual literacy activities and concepts, such as producing visual materials for a range of projects and using design strategies and creativity in image and visual media production, can be realized in library spaces. Makerspaces in libraries combine outreach and fun with the critical work of design and making. These activities support library learning goals, enrich library instructional programs, and provide grounding for bringing visual literacy learning outcomes into this worthwhile area of exploration and practice.

Evaluating Visual Products

Just as you would never hand in the first draft of a paper, it is important to review, reflect upon, critique, and revise the visual materials you create. You can employ techniques from design fields to help students and colleagues critique work, in addition to more familiar strategies such as peer review and checklists.

Use these reflection questions to assess the effectiveness of your visuals:

- Do other people understand what I am trying to communicate? How do I know?
- What might be ambiguous or confusing about my visuals?
- How can I improve or clarify my visuals?
- Are my design choices helping or hindering my overall visual communication?
- Is my visual product consistent with conventions in my field?

- Does my visual product meet my project goals?
- What will I do next?

Use **Activity 3.6: Design Critique** to guide students, and colleagues, through the process of critiquing visual products.

There may be occasions when you, or your faculty, need to formally evaluate student visual products or students' use of images in projects. Ideally, you'll want to consider how effectively the student's visual choices communicate her research or creative ideas *and* how well she deploys design strategies. When evaluating student work, rubrics that focus on the criteria in the assignment can help. Adapt our **Evaluating Visual Products Handout** (see page 88) to suit your needs.

HANDOUT

Evaluating Visual Products

Use some or all of these scales to evaluate a visual product.

Meaning Image use, or visual presentation, supports the project thesis, question, or intended meaning.

☐ *Strongly Disagree* ☐ *Disagree* ☐ *Neutral* ☐ *Agree* ☐ *Strongly Agree*

Style Visual style is appropriate to the project and intended audience.

☐ *Strongly Disagree* ☐ *Disagree* ☐ *Neutral* ☐ *Agree* ☐ *Strongly Agree*

Technology and Medium Technologies used and chosen media complement and enhance project goals and meaning.

☐ *Strongly Disagree* ☐ *Disagree* ☐ *Neutral* ☐ *Agree* ☐ *Strongly Agree*

Scholarly Use and Citation Images are used as scholarly products and are cited, credited, or captioned as appropriate.

☐ *Strongly Disagree* ☐ *Disagree* ☐ *Neutral* ☐ *Agree* ☐ *Strongly Agree*

Clarity Content is easy to read with appropriate use of fonts, background, and formatting.

☐ *Strongly Disagree* ☐ *Disagree* ☐ *Neutral* ☐ *Agree* ☐ *Strongly Agree*

Cohesiveness All elements are coordinated with the visual design.

☐ *Strongly Disagree* ☐ *Disagree* ☐ *Neutral* ☐ *Agree* ☐ *Strongly Agree*

Layout Layout uses horizontal and vertical white space appropriately.

☐ *Strongly Disagree* ☐ *Disagree* ☐ *Neutral* ☐ *Agree* ☐ *Strongly Agree*

Balance Images and text are well placed in relation to each other and are used with proportion and balance.

☐ *Strongly Disagree* ☐ *Disagree* ☐ *Neutral* ☐ *Agree* ☐ *Strongly Agree*

Graphics Images are thoughtfully chosen and enhance the content.

☐ *Strongly Disagree* ☐ *Disagree* ☐ *Neutral* ☐ *Agree* ☐ *Strongly Agree*

Overall Design Overall visual design (including use of color, typography, and layout) is visually appealing and meets project goals.

☐ *Strongly Disagree* ☐ *Disagree* ☐ *Neutral* ☐ *Agree* ☐ *Strongly Agree*

Comments:

Visual Literacy for Libraries: A Practical, Standards-Based Guide by Nicole E. Brown, Kaila Bussert, Denise Hattwig, and Ann Medaille (Chicago: American Library Association, 2016).

Next Steps

Design strategies help you think about and create visual communications. To continue building your confidence in image use and creation, try the following:

- Plan and storyboard your next outreach or teaching occasion.
- Apply basic design principles to a poster or presentation.
- Practice image editing and formatting.
- Use the design principles to evaluate a visual communication on your campus.

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ACTIVITY 3.1

Exploring Disciplinary Image Use

LEARNING OUTCOMES

- Identify ways that images are used within a discipline.
- Plan for the use of images in an upcoming project.

DESCRIPTION

Students use library resources to find scholarly works related to a topic of interest or course research assignment. Next, students look at the types of images used by the authors and the type of information that each image is being used to convey. Students use the **Images and Disciplinary Communication Worksheet** to keep track of what they find. For example, if the subject is molecular biology, a student might find the following:

1. Ribbon diagram—used to represent protein structure
2. Mass spectrometry graph—used to represent the spatial distribution of a molecular sample
3. Sequence alignment—used to highlight sequences that are conserved across species

In engineering, a student might find the following:

1. Model—used to represent the structure of a building meant to withstand earthquakes
2. Photograph—used to show damage that occurred to a building as the result of an earthquake
3. Graph—used to show seismic test data

TIP FOR SUCCESS

- You may want to begin this activity by reviewing different types of images, such as tables, graphs, charts, diagrams, and so on. As students share the different types and uses of the images that they find, observe commonalities of image usage within a discipline or differences in image usage among different disciplines, as appropriate. This activity works well individually or in small groups.

VISUAL LITERACY STANDARDS CONNECTION

- ACRL Visual Literacy Standard 5, Performance Indicator 1

Visual Literacy for Libraries: A Practical, Standards-Based Guide by Nicole E. Brown, Kaila Bussert, Denise Hattwig, and Ann Medaille (Chicago: American Library Association, 2016).

WORKSHEET

Images and Disciplinary Communication

Find three scholarly sources that are related to your topic and that contain *at least one* image, then complete the steps.

Step 1: List three to five different image types (e.g., table, chart, diagram, map, photograph, model, etc.) that you encounter, and describe each image's purpose.

SOURCE	IMAGE TYPE	IMAGE PURPOSE—WHAT DOES THE IMAGE CONVEY?
Example: Hattwig et al. (2012) article	*Example: array*	*Example: Depicts ACRL Visual Literacy Standards*

Step 2: Reflect on how you plan to use images.

Do your findings impact the types of images you might use in your research?

What information do you hope to convey with images?

ACTIVITY 3.2

Amplifying a Message with Visuals

LEARNING OUTCOMES

- Apply visual thinking skills to communicate a message.
- Experiment with increasing the visual impact of a message.

DESCRIPTION

Give students a text-heavy PowerPoint slide and ask them to circle all elements that could be represented visually. Instruct them to sketch a visual of a circled element. Students share their choices and their sketches. Then discuss how to apply this technique to amplify the impact of a message.

TIP FOR SUCCESS

- Make sure that the content of the PowerPoint slide is relevant to the students in the class.

OPTIONAL EXTENSIONS

- This activity is a good precursor to **Activity 3.3: Storyboarding.**
- As shown in the example, this activity can be adapted for a librarian professional development workshop.

VISUAL LITERACY STANDARDS CONNECTION

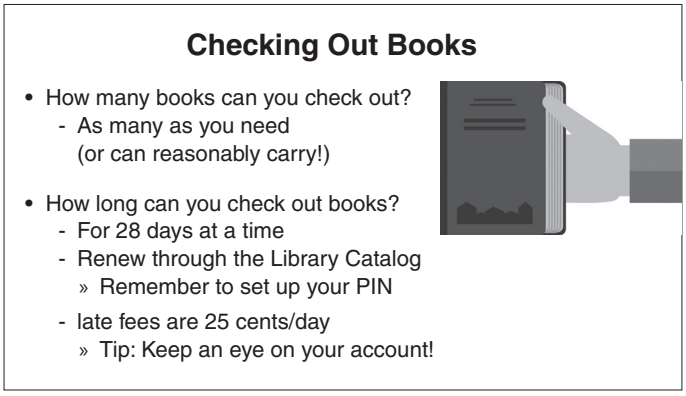
- ACRL Visual Literacy Standard 5, Performance Indicator 4
- ACRL Visual Literacy Standard 6, Performance Indicators 1 and 2

Visual Literacy for Libraries: A Practical, Standards-Based Guide by Nicole E. Brown, Kaila Bussert, Denise Hattwig, and Ann Medaille (Chicago: American Library Association, 2016).

EXAMPLE

Amplifying a Message with Visuals

This example is from a workshop for librarians.

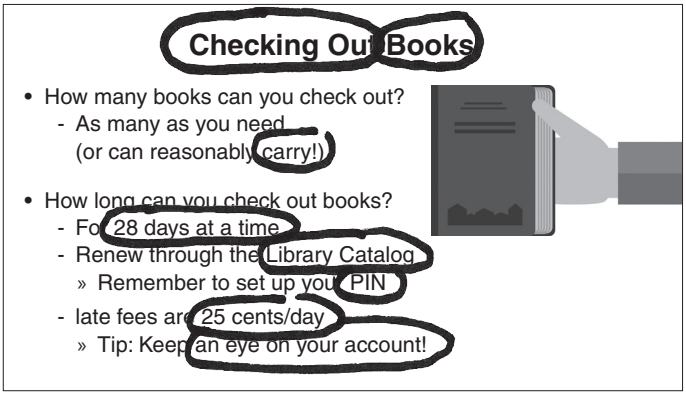


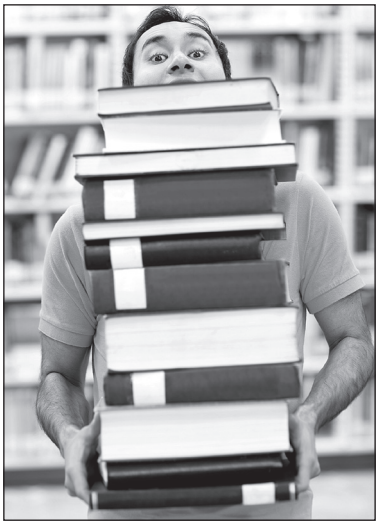
Step 1 Instructor asks participants to circle elements that can be represented visually.

Step 2 Each participant chooses one element to depict and sketches a visual.

Step 3 Participants share the elements they circled and their sketches.

Step 4 Instructor shares sample circled elements.





Step 5 Instructor shares a sample visual for an element (e.g., "as many books as you can carry!").

Step 6 Discuss how to apply this technique for creating messages.

Visual Literacy for Libraries: A Practical, Standards-Based Guide by Nicole E. Brown, Kaila Bussert, Denise Hattwig, and Ann Medaille (Chicago: American Library Association, 2016).

ACTIVITY 3.3

Storyboarding

LEARNING OUTCOME

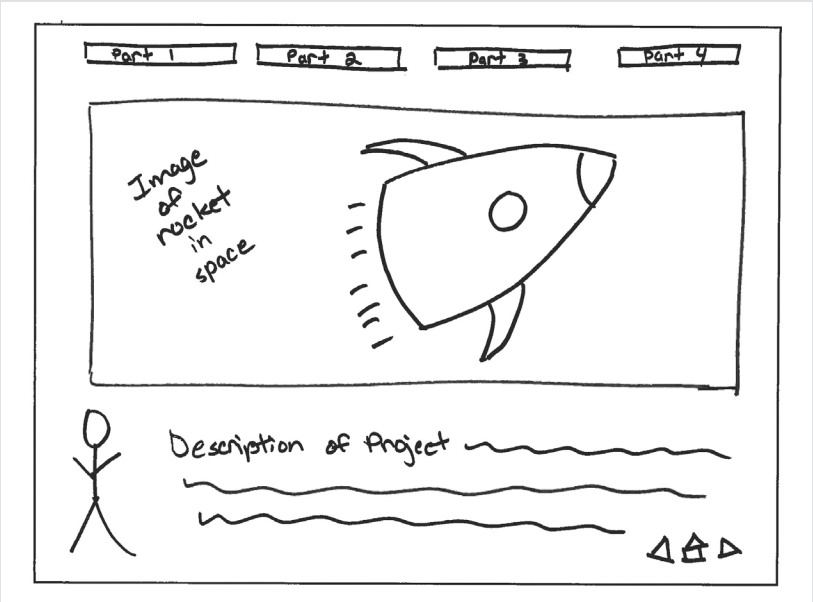
- Plan for the visual layout and design of a visual project.

DESCRIPTION

To prepare for a media project, students think about what they want their design to look like, then sketch it out in a storyboard. A storyboard provides the visual layout of content in a project and lists the basic elements that will be placed in each part of the design. Distribute a storyboard template, such as the one shown in the **Storyboard Template Worksheet**, to students. Ask students to roughly sketch their design in one or more boxes that represent each part of their media project. Text can be added below each drawing to list notes about the design or related image files.

TIP FOR SUCCESS

- Creating a storyboard does not require advanced artistic skill! It is best to keep the drawing simple and use stick figures or the like to represent design ideas. To get them started, show students an example or two, such as the following one.



VISUAL LITERACY STANDARDS CONNECTION

- ACRL Visual Literacy Standard 6, Performance Indicator 2

WORKSHEET

Storyboard Template

Sketch out your design ideas in the boxes below. Use a separate box for each major segment of your project. Use the space below each sketch to add notes or other details to help you implement the project later.

1. Description: _____

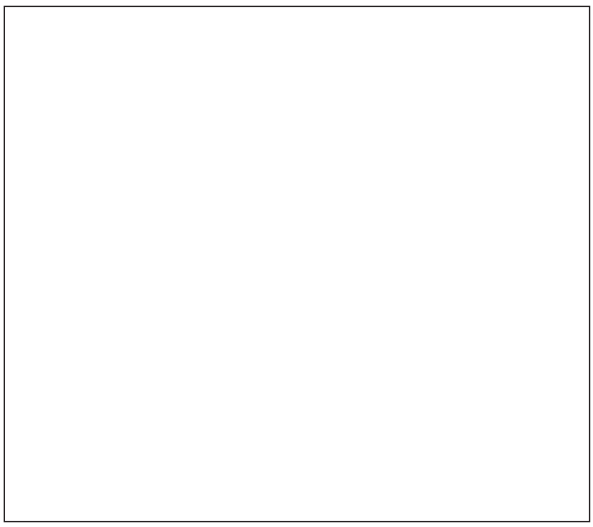
_____

_____

2. Description: _____

_____

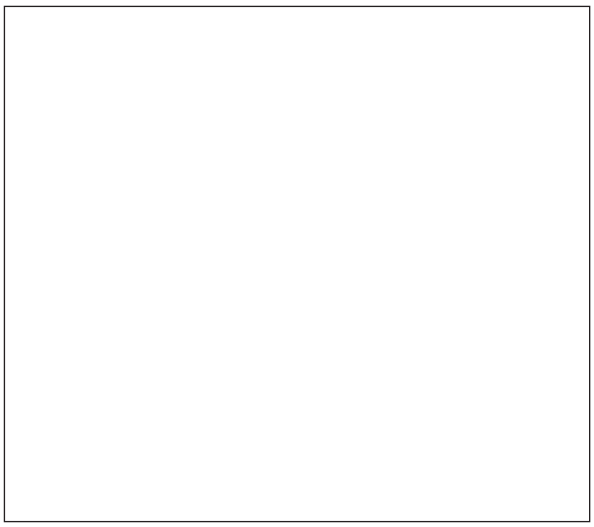
_____



3. Description: _____

_____

_____



4. Description: _____

_____

_____

ACTIVITY 3.4

Creating Graphical Representations of Data

LEARNING OUTCOME

- Construct graphic representations of data and information.

DESCRIPTION

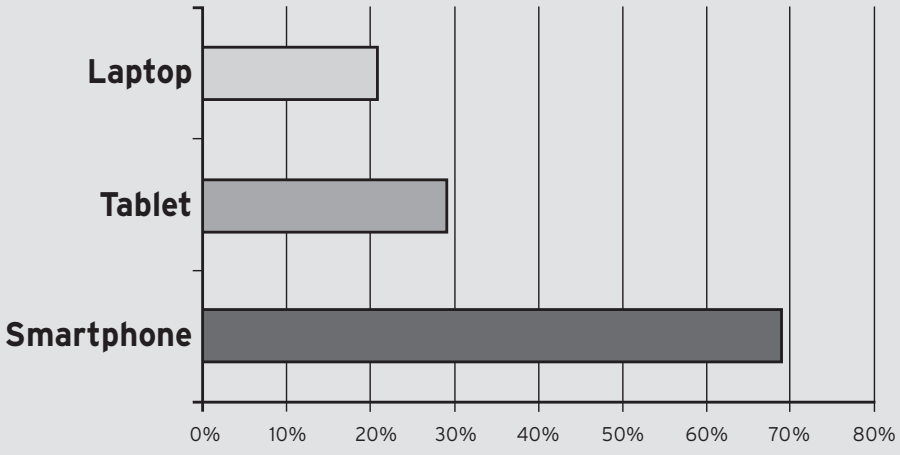
Show students different types of graphical representations of data and discuss the purposes for which they can be used. These might include bar charts, pie charts, line charts, flowcharts, tree diagrams, and others. You may also want to show students ways that data are presented through infographics or review some of the elements and principles of design. For more information, see the "Visualizing Data" section in chapter 1, "Interpret and Analyze Images."

Distribute a collection of data to students (such as the accompanying examples) and ask them to work with a partner (or partners) to represent all or part of it using some kind of graphical representation. This activity can be done using technology, but it works just as well to have students sketch their representations.

Students can express data using a variety of representations, as are shown in the accompanying examples.

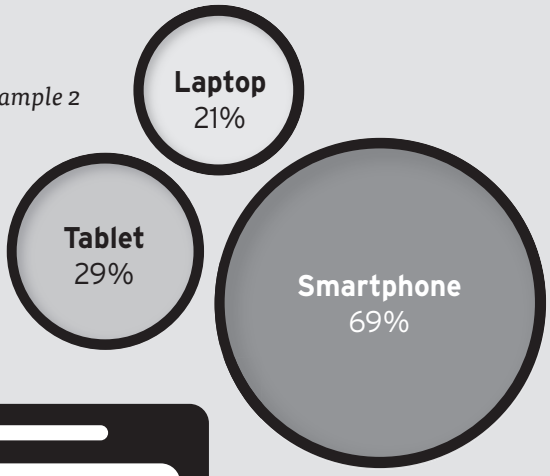
What percentage of students report that they are banned or discouraged from using their mobile devices in the classroom?

Example 1

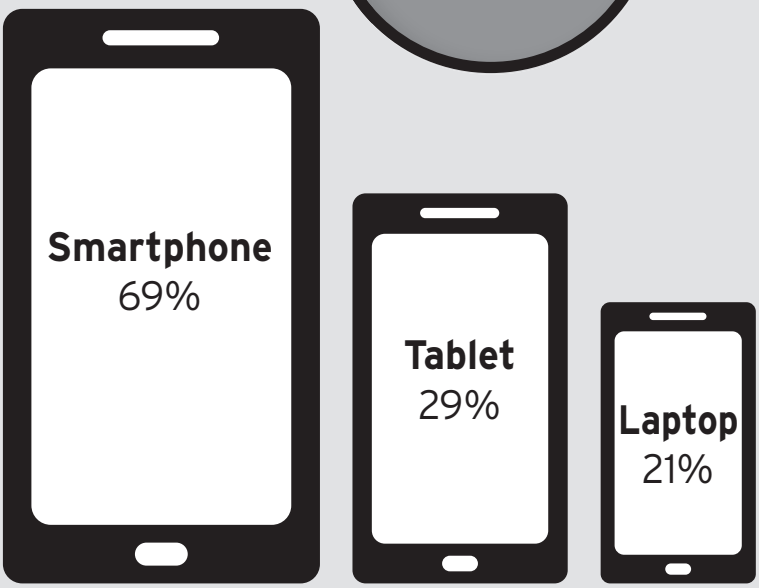


Visual Literacy for Libraries: A Practical, Standards-Based Guide by Nicole E. Brown, Kaila Bussert, Denise Hattwig, and Ann Medaille (Chicago: American Library Association, 2016).

Example 2



Example 3



OPTIONAL EXTENSION

- Data in this activity are drawn from Educause's 2014 *ECAR Study of Undergraduate Students and Information Technology* and are depicted visually through an infographic online (http://net.educause.edu/ir/library/pdf/ss14/Eig1406.pdf). If you use these data (or other data drawn from an infographic), show students the image after they have completed the activity and ask them how their graphic representations compare.

TIPS FOR SUCCESS

- If students have access to technology, it might help to have students look at some of the chart options that are available in Word, PowerPoint, Excel, or another type of software.
- You can distribute a data set related to the course topic. Consider presenting students with different types (time-based data, percentages, etc.).
- As an alternative to distributing data, have students conduct a short survey to collect their own data about a topic or find a data set online.

VISUAL LITERACY STANDARDS CONNECTION

- ACRL Visual Literacy Standard 6, Performance Indicator 1

EXAMPLE

Creating Graphical Representations of Data

Directions: Use one or more graphical representations (you select which) to communicate some or all (you select which) of the following data.

Does technology make students feel more connected?

- 51% feel more connected to other students
- 54% feel more connected to instructors
- 65% feel more connected to the institution

Do students learn best with online, partially online, or no online course components?

Students 18–24 years old

- No online components: 19%
- Partially online: 75%
- Completely online: 6%

Students 25+ years old

- No online components: 15%
- Partially online: 66%
- Completely online: 19%

What kinds of mobile devices do students own?

2013

- Smartphones: 76%
- Tablets: 31%

2014

- Smartphones: 86%
- Tablets: 47%

Projected 2015

- Smartphones: 90%
- Tablets: 58%

Do students report that they are allowed to use their mobile devices in the classroom?

Banned/Discouraged

- Laptop: 21%
- Tablet: 29%
- Smartphone: 69%

Encouraged/Required

- Laptop: 25%
- Tablet: 15%
- Smartphone: 6%

ACTIVITY 3.5

Editing Images

LEARNING OUTCOMES

- Experiment with image editing tools to make changes to images.
- Evaluate the reliability of images as visual communications.

DESCRIPTION

Experimenting with image editing tools can help students see the method behind the magic of "Photoshopping." Select an image relevant to the course content, look at the metadata together, and discuss the meaning of the image. Working in pairs and using image editing software, students make one change to the original image and identify the implications.

DISCUSSION PROMPTS

- What was changed from the original photograph?
- Was the change obvious and easy to find, or did it blend in with the original?
- Has the meaning of the original image been changed through editing? How so?
- Going forward, looking at similar images related to the topic at hand, what will you look for and what questions will you ask?

TIP FOR SUCCESS

- Begin this activity by discussing alterations in popular media to help students make the connections between image editing and changed meanings.

OPTIONAL EXTENSION

- Use a variation of **Coffee Break! Edit an Image** in the classroom.

VISUAL LITERACY STANDARDS CONNECTION

- ACRL Visual Literacy Standard 6, Performance Indicators 3 and 4

ACTIVITY 3.6

Design Critique

LEARNING OUTCOME

- Employ a design critique framework to evaluate visual products.

DESCRIPTION

The design critique process is used for peer feedback in the visual arts. To run this activity, you will act as a facilitator. Timing this activity will help it go smoothly, and we have included "(___ minutes)" in each section for you to fill in your own times. For each visual product being critiqued, give participants a **Reflection Worksheet** and a **Design Critique Worksheet**.

To begin, everyone fills out the Reflection Worksheet (___ minutes). Explain that these reflection notes will become talking points for the critique. Then start the design critique process.

- *Round 1* (___ minutes): A presenter explains the goal of the work-in-progress and mentions any roadblocks or challenges. Participants record notes.
- *Round 2* (___ minutes): Participants critique the work by writing answers to the following questions: What is the *best* thing about this work? What is *one* recommendation you would make to improve this work? Facilitate a discussion that sticks to these questions.
- *Round 3* (___ minutes): After all participants have given feedback, allow the presenter to describe plans for incorporating the feedback into the work.

TIPS FOR SUCCESS

- Design critiques work best for works-in-progress because they generate feedback that can improve the work. Be sure to explain that the goal of the critique is to bring in new perspectives to make the work stronger—this approach builds trust between the facilitator and participants.
- Timing each round helps to focus attention and keep the critique fair.

VISUAL LITERACY STANDARDS CONNECTION

- ACRL Visual Literacy Standard 6, Performance Indicator 4

WORKSHEET

Reflection

Think about the work you are presenting today and answer the following questions. You will use these as talking points to present your work to your peers.

What is the goal of this work? What do you hope it communicates?

What roadblocks or challenges have you encountered?

WORKSHEET

Design Critique

Round 1: Listen to the presenter explain the goal of the work-in-progress and roadblocks. Record notes here:

Round 2: Critique the work by answering the following questions.

What is the best thing about this work?

What is one recommendation you would make to improve this work?

Round 3: After all participants have given feedback, listen to the presenter describe plans for incorporating the feedback into the work.