

Color Accessibility

Colors can be a useful tool to convey complexity and differentiate content. In many cases, color can enhance the readability and organization of data. However, it's important to ensure that those with blindness, low vision, color blindness, dyslexia, or other cognitive or visual disabilities can perceive this complexity as well.

Contrast

Contrast is a measure of the difference in brightness, also known as **luminance**, between two colors. This difference is expressed as a ratio from 1:1 (e.g. white on white) to 21:1 (e.g. black on white). The figure below shows a variety of ratios from low to high contrast.

LOW 1.07 1.37 3.99 8.35 HIGH

When colors have insufficient contrast they can be difficult to read for students with cognitive or visual disabilities, or those who are fatigued or have eye strain from staring at a screen. The figure below shows what a low contrast color combination may look like to those with different types of color blindness.

Monochromacy

Achromatopsia (2.6:1)
no colour

Sample

Achromatomaly
almost no colour

Sample

Dichromacy

Protanopia
no red

Sample

Deuteranopia
no green

Sample

Tritanopia
no blue

Sample

Trichromacy

Protanomaly
low red

Sample

Deuteranomaly
low green

Sample

Tritanomaly
low blue

Sample

The Web Content Accessibility Guidelines (WCAG) is a document that explains how to make web content more accessible. It contains minimum contrast suggestions for different types of text in two categories. The first category, known as **AA**, is the general guideline for all people including those with mild to moderate visual disabilities. Most color pairings that do not meet AA contrast requirements are difficult to read even for those with good vision. The second category, known as **AAA**, details higher

contrast requirements that will make content accessible for those with severe vision disabilities.

Following AAA guidelines, when possible, will allow you to create content that is accessible for the most amount of people. The various requirements are detailed in the figure below. Normal text is often any text in the body of a document, while large text might be a title or bolded text. Graphical components include icons, the content of graphs or figures, a bounding box around a piece of text, and any other graphical item that conveys information.

Normal Text		Large Text		Graphical Component	
AA	4.5:1	AA	3:1	AA	3:1
AAA	7:1	AAA	4.5:1		

Graphical objects and components might include multiple colors next to each other such as multiple lines on a graph. In this case it is important to consider the contrast between items that are next to each other in addition to the contrast to the background color. Similarly, text might have multiple contrast ratios if it is on top of an image or a gradient background. We would recommend avoiding this whenever possible as it can make text unnecessarily difficult to read.

Color contrast checkers such as this [contrast checker by webAIM](#) can help you test the contrast of your chosen colors and adjust them until they meet accessibility standards. When checking contrast, remember that the opacity (also known as the transparency or alpha) of the colors will affect the contrast.

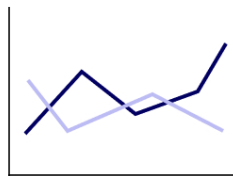
Additional Signifiers

Consider what the use of color is doing in your content; maybe it is highlighting an important phrase, denoting a deliverable, or drawing attention to an error message. What other signifiers--such as text styles, bounding boxes, icons, and shapes--can you add to convey this meaning? The figure below shows some examples of ways to add additional signifiers.



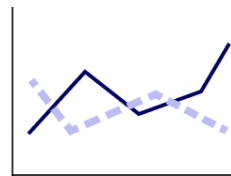
lorum ipsum dolor
sit amet

This is an error.



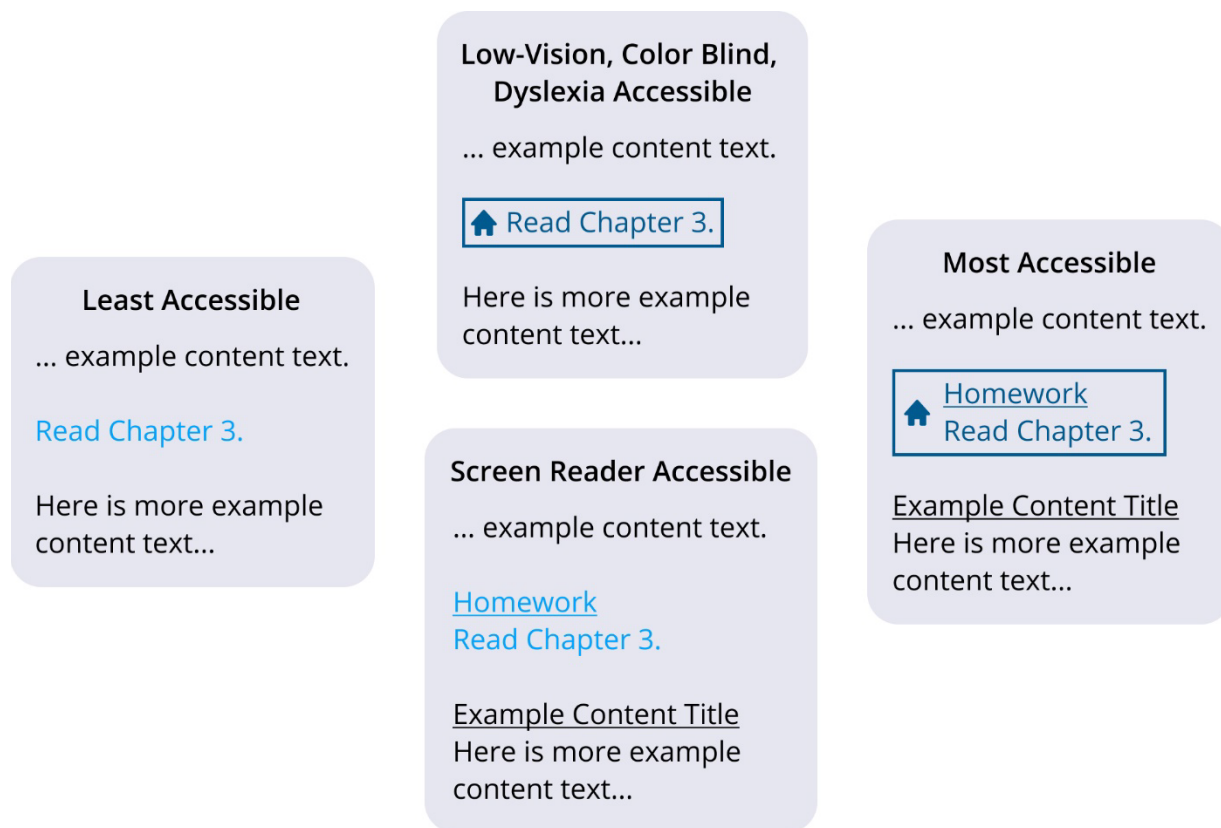
lorum ipsum dolor
sit amet

⚠ This is an error.



When considering where additional signifiers might be necessary, it can be helpful to view your content using a [screen reader](#) or a [color blindness simulation](#). Using these technologies, consider; what information or context is missing?

Low vision, color blind, and dyslexic users often benefit from additional shapes or text styles but this is not enough for individuals using a screen reader. For these individuals, using headings and other [textual signifiers](#) is vital. As such, a combination of visual and textual signifiers is often the most accessible option. The figure below shows a variety of options for denoting a homework task and for whom each option would be accessible.



Proactive Contrast Accessibility

An easy way to be proactive about color accessibility is to choose templates whose default colors are high contrast and accessible, such as those on our [list of accessible, default slide templates](#). When using a template not on this list, something to check is the default color of subtitles. Many templates can be made AAA accessible simply by increasing the contrast of the subtitle color. It is always best practice to test the contrast of your chosen colors.

Inaccessible contrast is also common in premade graphics, so it's important to keep contrast in mind when choosing graphics. If you find a great but less accessible graphic, modifying the colors can be a way to make that graphic more accessible, but this can take some extra time. For simple graphics, it may be worth it to create the graphic yourself instead of using premade graphics.

Fixing Contrast Issues in Images

Sometimes you may be using an image that contains text or graphical components. It is best practice to keep text out of images (so that it can be read by a reader or have the font, size, or color adjusted) when possible. But when not possible, or when the image contains an important graphical component, the next best step is to ensure high contrast. With premade images you can use [Adobe Photoshop](#) (or other photo editing tools) to adjust the colors inside an image. The figure below shows an example of the before and after using the replace color tool to increase contrast.

BEFORE

low contrast

AFTER

high contrast

To adjust the colors of an image with Adobe Photoshop, follow the instructions below.

1. With Photoshop open, click file → open and open the image from your computer.
2. Click Image → Adjustments → Replace Color (second from the bottom)
3. Use the eyedropper to select the color by clicking on a place in the image that contains that color
4. Use the hue, saturation, and lightness sliders on the bottom of the panel, or click the result swatch for more controls, to adjust the replacement color. You should see your image update in real time.
5. Optional: Adjust the fuzziness slider to increase or decrease the range of colors included in the selection. If the selection isn't including all the text, increase the fuzziness. If it's including too much of the image, decrease it.
6. Click OK. If the text has a halo of its previous color, undo the color switch and redo it with increased fuzziness.
7. When you are happy with the colors, click file → save as and select a location to save the file. Save the file in your preferred format.

Additional Resources

For occasional use, the [contrast checker by webAIM](#) is a website where you can input the **hex** values of colors to see their contrast and adjust colors until they comply with guidelines.

For increased use, [TPGI Color Contrast Checker](#) is a software download that uses an eyedropper tool to check contrast of items. It exists as a popup on your computer so it can be used with any application.

For more detailed information on color contrast and accessibility, see [webAIM's article on Contrast and Color Accessibility](#).

Related Articles

Color Accessibility Infographic

Color Contrast Checkers Infographic

Color Accessibility Checklist

webAIM Color Contrast Checker

TPGI Color Contrast Checker

Sources and Citations

<https://helpx.adobe.com/photoshop/using/replace-colors.html>

<https://planetphotoshop.com/replace-color.html>

<https://www.w3.org/WAI/WCAG21/Understanding/contrast-minimum.html>

<https://webaim.org/articles/contrast/>