Welcome students.

In this video we will look at some topics under color theory Unit 2, which is color gamut, ICC profile and gamma correction.

This is the module #6. The outline of this presentation includes color gamuts, ICC profiles, and gamma correction.

At the end of this video, the students will be able to understand the concept of color gamut, ICC profile, and gamma correction.

What are color gamuts?
When we have different devices, different monitors which are made by different manufacturers, so let us say we have this monitor and this monitor over here, the colors displayed on one monitor may not be the same as the colors displayed on another.

Similarly, if you have a picture of an apple displayed on this monitor, the color as seen on the monitor may not be the same as in the print out. That's because different devices produce colors differently.

Hence we have to know about color gamuts.

The term color gamut refers to the range of colors a device such as monitor, projector, scanner or printer can reproduce. The larger or wider the gamut, that is the range of colors we can see, richer, saturated colors as you can see here in this diagram.

Different devices can show different set of colors. The visible spectrum, that is, the colors which we can see, consists of billions of colors, so it represents the largest size, as seen over here.

So it consists of billions of colors, whereas a monitor can show a smaller subset that is, it can show or it can display millions of colors. A high quality printer will be able to show or produce only a few thousand colors, which would be a smaller subset, whereas older systems may be limited to only 216 cross platform colors.

That's the reason why we have to know about color gamuts. As color gamuts or the range of colors which are device can produce becomes smaller, it is generally the richer saturated colors that are the first to suffer, and a technical phenomena which is referred to as clipping.
The clipping phenomena is most apparent when converting from RGB to CMYK. RGB are the colors used by monitors, whereas CMYK are the colors space used by the printers with many of the rich, saturated colors that are available in RGB may no longer be available in the CMYK color gamut,

So if you look at this picture here you can see that in the RGB we have this red saturated color and here you can see the difference over here.

Similarly with all the other colors so the colors will not be produced exactly the same.

As you see it on the monitor, you will not see it on the printer. So reproducing colors can be problematic with regard to printed digital media. Becauses what we see is not what is possible to get, although a monitor may be able to display true colors, that is millions of these colors are outside the spectrum which is available to printers. Since digital designs are generated using the RGB color system colors used in those designs must be a part of the CMYK spectrum or they will not be produced with proper color rendering.

So working with CMYK color system ensures proper color rendering. To help in this color rendering, we have something called the ICC profile.

The International Color Consortium was formed in 1993 by 8 different vendors in order to create an open vendor neutral color management system which could function transparently across all operating system and software packages. So color used on one system would look almost the similar or exactly the same on some other system.

The outcome of this cooperation was the development of the ICC profile specification. Here you can see how the color matching process works using the ICC profile. So if you have a source profile, say a monitor, and it has its source color values. These are given to something called the Profile connection space and a color matching method is used, which again has the input from the destination profile.

Say it's a printer and this color matching will then tell what is the color value which is to be given to the destination so that the color in the source and the color in the destination will look alike.

So ICC profiles are used to match the color values of your display with a particular device, such as your camera, printer, scanner, etc.

The ICC profile is basically a look up table. with certain properties of a color gamut, where a particular color will be displayed as the exact shade of it and not any random tone of that color. When doing color critical work in softwares like Photoshop, it's imperative or necessary to have calibrated displays, printers as you as you would naturally want to see the same result on the print as that on your monitor.

Digital images and graphics have their own ICC profiles, and in order to ensure that images that you are about to work on is displayed accurately, designers have to match the ICC profile of the image with the monitor and implement the corresponding ICC profile into the computer's operating system.

Once this steps are completed, the color of the image will be properly displayed.

So that was the ICC profile.

Another important aspect with colors is gamma correction.

Gamma correction is basically dealing with the brightness or the luminance value of image pixels.

So for example, if you can see this image on top, the brightness of the image is not very clear, but after doing the gamma correction, the image becomes more better visible.

So what is this gamma correction?

Basically, each pixel in an image has a brightness level which we call luminance. This value can be between zero to 1, where 0 means complete darkness or black and one is brightness white.

Different camera or video recorder devices do not capture this luminance correctly. Different display devices, monitors, phone screens, TV's do not display luminance correctly so because of that one needs to correct them and hence we have a function to correct them which is called the gamma correction function. The gamma correction function is a function which is used to correct image luminance so that the visibility of the image is better.

So in this video we saw color gamut, ICC profiles, and gamma correction with respect to color theory.

These are the references. These are some additional web references.

Thank you.