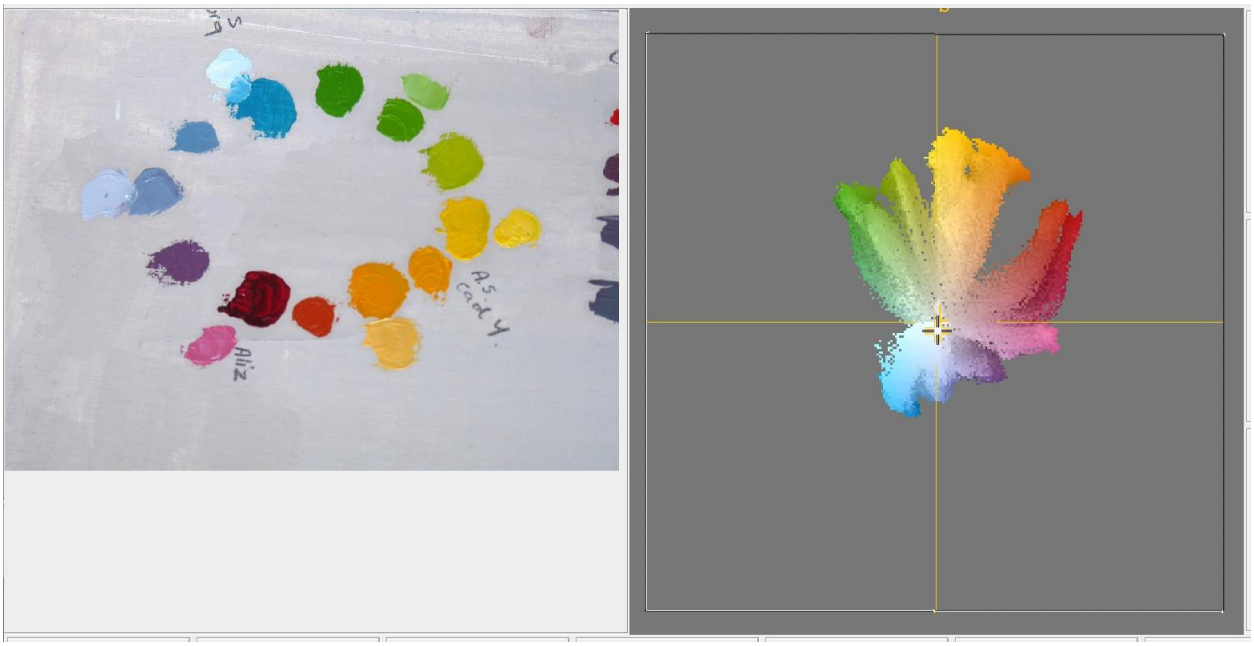
COLOUR LITERACY PROJECT

COLOUR EXPLORATION EXERCISE

TITLE: Colours in space

SUBMITTED BY: David Briggs, National Art School, Sydney, Australia
CONTACT INFO: djcbriggs@gmail.com



*Photograph of mixtures of Art Spectrum Turquoise, Cadmium Yellow and Alizarin Crimson, with added white in some mixes, plotted in CIE L*a*b* using ColorInspector 3D plugin in ImageJ, and viewed vertically in a*b* plane to show gamut in terms of hue and chroma.*

KEYWORDS: Paint mixing, colour space, hue, lightness, chroma

BRIEF DESCRIPTION: On canvas scraps or sealed paper/ cardboard, students prepare sequences of paint mixtures showing the intermediate colour steps that can be obtained from mixtures of various combinations of paints, which might include (1) a transparent coloured paint mixed with white paint, (2) an opaque coloured paint mixed with white paint, (3) a transparent coloured paint thinned over a white ground, (4) two paint mixtures matched to the same lightness, (5) a tint mixed with black paint, and/or (6) one or more sets of three selected coloured paints mixed in pairs to form a circle or triangle. The students should observe and describe the sequence of colours in each series in terms of both major and more subtle shifts in hue, lightness and chroma, and photograph each series. The teacher or student can then open the photographs in the program Image J and observe the mixing paths from various directions in CIE L*a*b* using the Color Inspector 3D plugin, wherever possible relating features of the three-dimensional mixing paths to the observed colour attributes.

LEVEL: Post Secondary. Advanced High School

GENERAL INFORMATION:

Exercise Title	*Colours in space*				
Course Title & Level	*Understanding and Applying Colour* (Public Programs online short course)				
Ideal environment	Home:	Classroom:	Laboratory:	Online:	(any) **X**
Duration	Up to 3 hours				
Learning Outcomes	1. Adjust paint mixtures in a controlled way to produce evenly graded or stepped sequences of paint colours				
	2. Observe and describe the colour changes in each sequence in terms of major and more subtle changes in hue, lightness and chroma				
	3. Wherever possible, relate the three-dimensional mixing paths as plotted in L*a*b* space to the observed changes in colour attributes.				
	4. Observe and describe regularities in the mixing paths in each kind of mixture to be able to anticipate mixing paths of similar paint mixtures.				

STEP BY STEP INSTRUCTIONS:

Step	Description	**Resources** (Materials, Software)
1.	Students prepare sequences of paint mixtures on canvas or sealed paper or cardboard showing the intermediate colour steps that can be obtained from various combinations of paints. Depending on the available time, instructions can be chosen from the alternatives listed below. • Mix a transparent coloured paint (e. g. phthalocyanine blue or green, permanent rose) with progressively increasing amounts of white paint. • Mix an opaque coloured paint (e. g. lemon yellow) with progressively increasing amounts of white paint. • Thin a transparent coloured paint progressively over a white ground. • Mix two paint mixtures matched to the same lightness (greyscale value) in progressively varying proportions. • Mixing a tint (colorant paint + white paint mixture) with progressively increasing amounts of black paint. • Mix three selected coloured paints progressively in pairs, to form a circle or triangle. Optionally, compare the gamut obtained with that obtained using another set of three paints. For example, examine the effect of changing just one of the three paints, or compare a completely different set, such as three earth colours vs three-high-chroma colours. [If using dark transparent colorant paints such as the phthalocyanine colours,	Oil or acrylic paints, palette knife, canvas scraps or other support. (Seal paper/cardboard supports with acrylic binder medium or gesso).

	some white paint can be mixed in to give a fuller indication of the gamut that can be obtained]. The colours of the mixtures in each series can progress either in approximately even perceptual steps, or as a continuous gradation, as long as the complete mixing path is represented.	
2.	The students should observe and describe the sequence of colours in each series in terms of both major and more subtle shifts in hue, lightness and chroma.	As above
3.	Students photograph each sequence, aiming for even illumination across whole sequence, and avoiding highlights and excessively raking lighting as much as possible. Also, to ensure that each paint colour translates to a well-defined photographic image colour, the paint surfaces should be flat, that is, not too disturbed by ridges of paint or by the weave of the canvas.	Digital camera
4.	The teacher or student can then open the photographs in the program *Image J* and observe the mixing paths from various directions in CIE L*a*b* using the *Color Inspector 3D* plugin, wherever possible relating features of the three-dimensional mixing paths to the observed colour attributes.	*Image J* including the *Color Inspector 3D* plugin (see below)

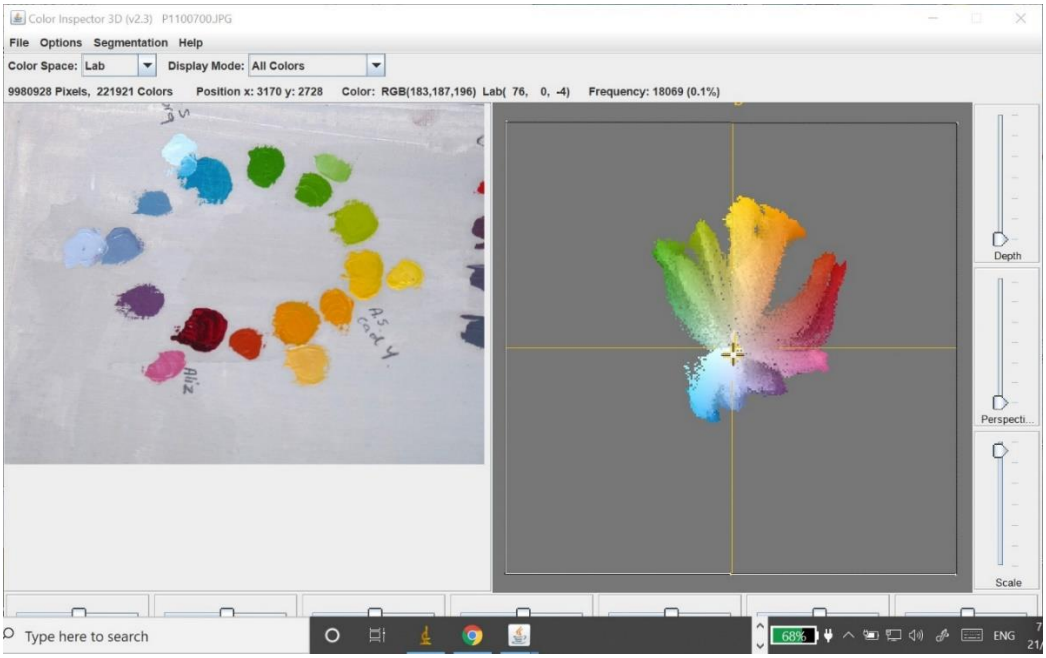
Software resources:

Color Inspector 3D
Available as plugin for ImageJ and standalone program
https://home2.htw-berlin.de/~barthel/ImageJ/ColorInspector/help.htm
Image J
https://imagej.net/downloads

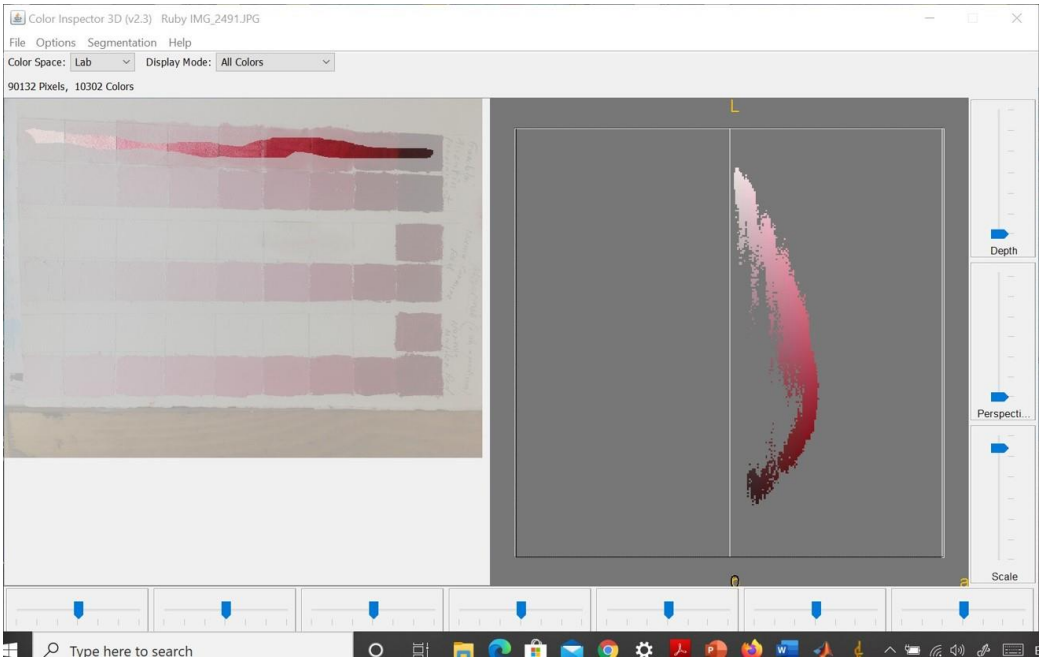
EVALUATION GUIDELINES:

Student performance is not assessed in *Understanding and Applying Colour*, but in formal education I would recommend that this introductory exercise is not assessed normatively, but subject only to formative feedback, drawing attention to particularly well executed paint sequences and photographs and the positive consequences of these in generating clean mixing paths in L*a*b* space. The succeeding exercise on matching a target colour by adjusting hue, lightness and chroma would be much better suited to normative assessment.

ADDITIONAL MATERIAL:



*Photograph of mixtures of Art Spectrum Turquoise, Cadmium Yellow and Alizarin Crimson, with added white in some mixes, plotted in CIE L*a*b* using ColorInspector 3D plugin in ImageJ, and viewed vertically in a*b* plane to show gamut in terms of hue and chroma.*



*Selection from photograph of swatches of Gamblin Permanent Alizarin Crimson thinned progressively over a white ground, plotted in CIE L*a*b* using ColorInspector 3D plugin in ImageJ, and viewed horizontally in L*a* plane to show path of swatches in terms of lightness and chroma.*