

3.	Optics & displays: RGB Color Mixing (screens & LEDs)
Target group	Pupils
Age pupils	10–12
Duration	1-1.5 hours
Content	 By using three colored light sources – red, green, and blue – students explore how new colors are created through additive color mixing. They observe how the colors blend on a white surface, record changes with a spectrometer, and compare visual and measured results. The activity connects everyday technology, like screens and LED lights, with the basic physics of light and color perception By combining red, green, and blue light sources, you can reproduce almost any color visible to the human eye. This experiment demonstrates additive color mixing — the same principle used in TV screens, phone displays, and smart bulbs.
Materials and tools	• 3 flashlights or small LEDs (red, green, blue) • Colored transparent foils, (if you only have white flashlights) • Thin black foil • White paper or wall for projection • Tape or holders to fix lights in place • Power supply or batteries • Spectrometer (or smartphone with spectrometer app) • Optional: smart lightbulb
Explanation	When you overlap beams of colored light, the colors add together rather than block each other (as with paint). • Red + Green = Yellow • Red + Blue = Magenta • Green + Blue = Cyan • All three = White The principle is called additive mixing, because each color adds light energy to the final perception.
Instructions	1. Setup Your Lights Arrange your red, green, and blue lights so they overlap on a white surface. Example: Aim three flashlights at the same spot on the wall, slightly from different angles. 2. Experiment With Color Overlap Turn on two at a time and observe: what color do you get when they mix? Try changing the intensity (cover one of the sources with the thin black foil). 3. Record Observations Place your spectrometer (or a smartphone spectroscopy) so it captures the mixed light. Observe how each single color shows a distinct peak, and how combined colors produce multiple peaks. Challenge: Can you find the right balance of intensities so that your spectrum spans the full visible range — creating white light?

Think Like an Engineer	Here you can add questions and texts that may trigger curiosity and trigger learning • Why does “white” appear white, even though it’s made of many different colors? • If you changed the background color (for example to blue paper), would the mixed colors look different? • What do you think happens inside a screen to create all the different colors you see? • Do you think our eyes mix colors in a similar way? How might that work? • Can two colors that look the same to us have different spectra? How could you check?
Bonus Ideas	• Afterimage Trick: Stare at a red light for 20 seconds, then look at a white wall. What color do you see? Try it with green or blue! • Color Shadows: Hold your hand in front of the lights — how many different colored shadows can you create? Why are they different?
Evidence	participant count