

DRIVING QUESTION

How has dye chemistry evolved from natural pigments to synthetic and sustainable alternatives? How can the chemistry of dyes help us create more sustainable color technologies for the future?

PROJECT SUMMARY

Students will study dye chemistry from natural pigments to modern synthetic and eco-friendly dyes, exploring sustainable colour technologies. Through lab experiments, they will extract and compare natural and synthetic dyes, analysing factors that affect colour stability and intensity. Research will cover the history of dyes, current industrial processes, and developments in sustainable chemistry like biodyes, nanomaterials, and green methods. The project ends with a public presentation and gallery walk showcasing dyed textiles, lab results, and visuals linking chemistry, history, and sustainability.

REAL-WORLD CONTEXT

This project links students with real-world advancements in textile science and green chemistry. Dyes serve as a practical illustration of the intersection between chemistry, art, and environmental science in global industries. Through this project, students will investigate how chemical processes impact color stability, solubility, and sustainability across fashion, manufacturing, and material design.

PRODUCTS & AUDIENCE

Students presented to NCSU faculty who work closely with Nanoparticles and the Plant Science Initiative.

STUDENT REFLECTIONS

- “I definitely had to learn patience somewhat. Since I’ll have to deal with people who might be more difficult than others in Nurse Aide, and this made me grow with that.”
- “Having the feedback was helpful, since it allowed us to go from a low rough draft grade to a high final product.”

NC PORTRAIT OF A GRADUATE SKILLS GAINED



COLLABORATION



EMPATHY



COMMUNICATION



ADAPTABILITY



LEARNER'S MINDSET



PERSONAL RESPONSIBILITY



CRITICAL THINKING

TEACHER REFLECTION

“Using group contracts and regular checkpoints really helped students stay on track during the PBL journey. These tools gave them a clear sense of responsibility and kept everyone engaged. They also made it easier to the ease of working together, manage time wisely, and communicate openly—plus, they created space for meaningful feedback at every step. Some of the things I have realized when it comes to the content, I was thinking about making this a Q2 wide PBL with mini lab(s) spread throughout where students are using molarity, concentration, chemical equilibrium, and theoretical yield. It also allows us to connect better with local business partners, PSI @ NC State’s outreach office, Friday Institute, and the Science House. I am hoping that knowing and using some of those connections to develop other activities as checkpoints for students where they will ultimately create tangible products.”