

Culture of Repair: The Science of Adhesives

With this activity, learners will:

Everyday in New York City, more than 12,600 tons of waste moves through city streets toward a landfill in somebody else's backyard. Landfills bring hazards such as odor, smoke, noise, bugs, and water supply contamination. As a remedy to the endless throw away cycles of purchasing and discard that have become part of American life, circularity is a way to eliminate waste through repair and reuse. While this can be a challenging concept to communicate in the classroom, integrating it with science through experiential activities incorporates ways of sustainable living that are meant to reduce waste and overconsumption in the classroom. In this pamphlet, learners can gather scientific knowledge and classroom tools to promote active participation in sustainable living through an exercise in repair.

1. Be introduced to the molecular science behind the function of adhesives

2. Reflect on what materials and bonding agents work best together

3. Apply this knowledge to more sustainably mending broken supplies in their classroom

The Culture of Repair curriculum consists of a workshop on the molecular science behind adhesives and focuses on how different binding agents interact with various materials. Participants will learn about different types of bonds and how to choose the most suitable adhesives for repairing broken items in their classroom.

**What adjectives would you use to describe adhesives?!
Did you know there's a "spectrum of stickiness" for different adhesives?**

We define stickiness in two ways:

1. Adhesive bonds that occur between the glue's molecules and the molecules of what the glue is sticking to.

2. Cohesive bonds that occur between the glue's own molecules, holding them together.

For example, adhesive bonds make wet glasses stick to a coaster, while cohesive bonds allow the water outside the glass to stick together and form droplet shapes. By varying the strength of adhesive and cohesive bonds, the spectrum of stickiness in adhesives can serve different purposes.

Culture of Repair: Repair Like A Scientist

After reviewing the different types of bonds, this activity is intended as a follow-up to get participants to try bonding different kinds of materials, visualize the applications of adhesives, and think through the questions we should be asking when fixing an object. This is an activity to figure out how to repair objects. Students make a hypothesis and conduct an experiment to determine what kinds of adhesives work well with different kinds of materials.

This experiment works with a wide range of materials, so choose whatever you have available! Students can also bring in recycled materials from home, such as cardboard boxes, soda cans, scrap fabric, etc.

Guiding Question:
When should we use _____ for repair?

Materials Needed

Circle the materials you have, and add any more of your own!	Circle the adhesives you have, and add any of your own!
<ul style="list-style-type: none"> • Paper • Cardboard • Fabric • Wood • Aluminum • Bubble wrap • Hard plastic • Other... 	<ul style="list-style-type: none"> • Hot glue • Elmer's glue • Wood glue • Scotch tape • Duct tape • Staples • Other...

Material sourcing is an opportunity to talk about where different materials come from. How are these materials made? What happens to them when they are discarded? This discussion could happen at many different levels of depth depending on the ages of the students.

Context Questions

1. Where do these materials come from? How are these materials made? What happens to these materials when they are discarded?
2. How many kinds of materials do we have? How many ways are there to combine our materials? How many samples do we need of each one?
3. How do different kinds of adhesives work? What is the chemistry behind them?

Adhesive Observations

- What do we observe about our adhesive?
- How long does it take to dry?
- What does it feel like when it's dry?
- What does it look like when it's dry?
- How does it work?
- How is it applied?

Material Observations

- What do we observe about our materials?
- Are they rigid or flexible? Do they fold?
- Do they feel smooth or rough?

Evaluation Questions

- How will we know if an adhesive has "worked" or not? What material combinations do we think this adhesive will be most effective for? Least effective for? Why?

Reflection Questions

- What are some scenarios where this adhesive would be helpful?
- What are some scenarios where it wouldn't be helpful?
- What questions should we ask ourselves when we need to fix an object?