

Sun Prints as a Measuring Tool

Controlled variables, timing and measurement, and comparing results across trials.

AGE RANGE

2nd grade and up

TIME NEEDED

About 20 minutes per child

THE BIG IDEA

Cyanotype paper is chemically primed to turn a deep blue when it is hit by UV light, and the longer the exposure, the darker the blue. That makes it a natural stand-in for a lab timer: if you keep every other condition the same and only change how long each sheet sits in the sun, whatever difference shows up in the final color can only be explained by time. That is a controlled experiment, and kids can see the proof drying in front of them.

LEARNING OBJECTIVES

- Identify what a controlled variable is, by holding everything constant except one factor (exposure time).
- Practice timing and measurement using a stopwatch or timer.
- Record predictions and observations in a simple data log.
- Compare results across multiple trials and describe the pattern.

MATERIALS

- ☐ Cyanotype paper, pre-cut into squares, kept in a dark bag or box until use
- ☐ Small flat objects to arrange on the paper (leaves, keys, lace, cut paper shapes)
- ☐ Exposure log sheets, one per child
- ☐ A tray of water for rinsing
- ☐ A timer or stopwatch
- ☐ Direct sunlight, or a UV lamp as a backup on cloudy days

PREP BEFORE KIDS ARRIVE

Cyanotype paper is light-sensitive, so keep it in its dark packaging or a closed opaque bag until the moment it is actually placed in the sun, ordinary room light will not ruin it quickly but direct sun will start the reaction immediately. Pre-cut paper into four squares per child so the timing steps move quickly, and set up the water tray somewhere close to the sun exposure spot so prints do not sit around fully exposed while waiting to be rinsed.

RUNNING THE ACTIVITY

1

Explain the setup

Tell the child the paper is “waiting” to turn blue the moment it sees strong sunlight, and that today they are testing how much time changes the result. Everything else (the object, the paper, the sunlight) stays the same across all four trials, only the time changes.

2

Arrange objects out of direct sun

Working in shade or indoors, have the child arrange a small object on each of the four paper squares. Keep the same object and arrangement across all four squares if possible, that is what makes this a fair, controlled test.



PHOTO GOES HERE

Photo: objects arranged on the paper squares, before exposure

3

Predict the outcome

Ask the child to guess, out loud or on the log sheet, which square will end up darkest and which will end up lightest before any exposure happens.

4

Expose the four squares for different times

Move the squares into direct sun one at a time, or all at once staggered, for 1, 2, 4, and 8 minutes respectively. Use the timer for each and pull each square at its assigned time.



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Photo: squares in direct sun, timer running

5

Rinse each print right after its exposure

As soon as a square's time is up, rinse it in the water tray. This stops the chemical reaction and reveals the true final blue, leftover chemical washes away and the object's silhouette appears as a clean white shape.

6

Dry and compare

Lay the four prints flat to dry side by side. Compare the depth of blue across the four exposure times and have the child fill in the actual results on the log sheet next to their earlier prediction.



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Photo: all four dried prints side by side, lightest to darkest

DISCUSSION QUESTIONS

- What stayed exactly the same across all four squares? What was the one thing that changed?
- Would this still be a fair test if you used a different object on each square? Why or why not?
- What do you think would happen on a cloudy day, would the same four times give the same results?

IF SOMETHING ISN'T WORKING

- Prints come out very pale, even at 8 minutes: the sun may be weak (early morning, late afternoon, or overcast), extend all four times proportionally and try again.
- No white silhouette detail, everything is dark blue: the object may be too thin or translucent to block light well, try a denser, more opaque object.
- Uneven color across one square: the object likely shifted during exposure, a light weight (a small stone at each corner) can help keep it in place.

EXTENSIONS FOR OLDER OR FASTER KIDS

- Design a second test that changes a different variable on purpose (distance from a lamp, or degree of cloud cover) while holding time constant, and predict what will happen.
- Test partially transparent objects (thin fabric, tissue paper) and observe the range of blues that come through, rather than a clean white silhouette.

**A few things to keep in mind**

Cyanotype paper is treated with iron-based compounds. Commercially pre-treated paper is safe for kids to handle with ordinary care, but everyone should wash hands after handling it and before eating, and it should not be put in the mouth. Keep unused paper in its dark packaging until the moment of use. Rinse water in small classroom quantities is fine to pour down a sink drain. Because this activity happens in direct sunlight, apply normal sun safety, hats, sunscreen, and shade breaks as needed.