Visualizing Fingerprint Details With A Balloon Activity

Brought to you by the National Institute of Justice's Forensic Technology Center of Excellence (FTCOE)

Background

Explore the unique patterns of fingerprints with this engaging and hands-on activity! By creating an enlarged version of a fingerprint on a balloon, students can examine the intricate details and unique patterns that make up an individual's fingerprints. This activity provides a fun way to learn about fingerprint pattern types, minutiae, and the science behind fingerprint analysis.

Supplies:

- Balloon (white or other light color)
- Black ink pad
- Wet wipes or access to a sink for cleanup

Optional:
Air pump

What to Look For:

There are three major pattern types: loops, whorls, and arches. Each finger has one pattern type and individuals may have a mixture of pattern types.

Pattern Types

Loops

Left Loop

Right Loop

Arches

Plain Arch

Tented Arch

Whorls

Plain Whorl

Double Loop Whorl

Central Pocket Loop Whorl

Accidental

Examples of Minutiae

Bifurcation

Enclosure

Ending Ridge

Short Ridge

Dot

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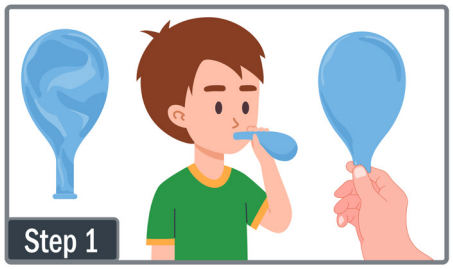
Step-By-Step Instructions

Step 1: Prepare the Balloon

Stretch the balloon multiple times to prepare it for easy inflation and lay it on a flat surface, ensuring there are no creases, and an area of the balloon is flattened enough to fit a fingerprint.

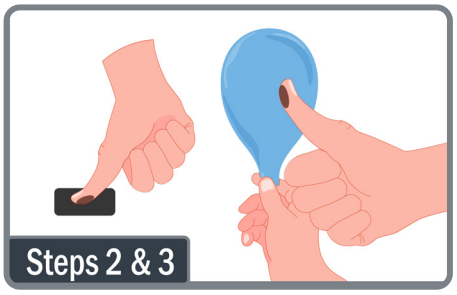


Step 2: Ink the Finger

Gently press one finger onto the ink pad, ensuring the entire fingertip is evenly coated with ink.

Step 3: Make the Fingerprint

Carefully press the inked finger onto the flattened balloon, holding it steady for a few seconds to transfer the print. Make sure the print is clear and complete. Clean off fingers with a wet wipe or in a sink to avoid unintentional ink transfers.



Step 4: Allow the Ink to Dry

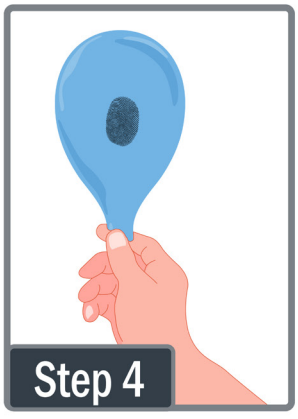
After applying the ink, allow it to dry for a few moments to prevent smudging.

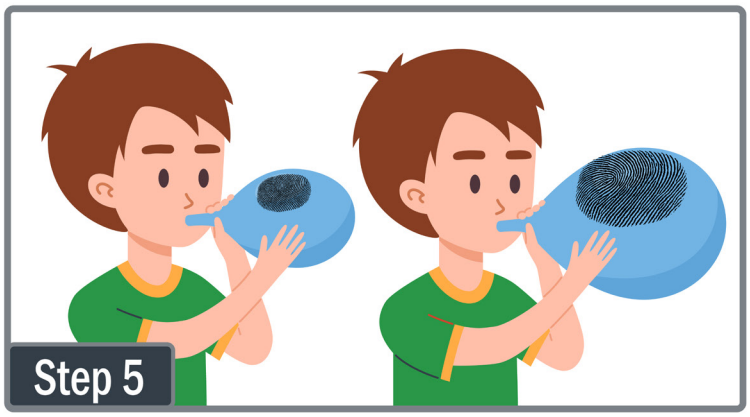
Step 5: Inflate the Balloon

Slowly blow up the balloon to its full size. As the balloon inflates, the fingerprint will “grow” in size, making the details more visible.

Step 6: Observe, Discuss, and Analyze

Once the balloon is fully inflated and knotted/tied shut, examine the fingerprint. Look for different pattern types (such as loops, whorls, and arches) and minutiae (small details like bifurcations, ending ridges, and dots).





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Discussion Questions

What are fingerprints and how are they formed?

Fingerprints are patterns of ridges and valleys on the surface of our fingertips. They are formed during fetal development and are influenced by both genetic and environmental factors. The unique patterns are determined by the arrangement of skin cells and the growth environment in the womb.

What are the different types of fingerprint patterns (loops, whorls, arches) and minutiae (e.g., bifurcations, dots, ending ridges) observed on the balloon?

The three main fingerprint patterns are loops (which make up about 60-65% of all fingerprints), whorls (30-35%), and arches (5-10%). Loops have ridges that enter from one side, curve around, and exit the same side. Whorls form circular or spiral patterns. Arches have ridges that rise in the center and flow outward without looping.

How does the enlargement of the fingerprint help forensic scientists in real-life situations?

Enlarging a fingerprint, as done on the balloon, mimics how forensic scientists might use digital tools to magnify fingerprints for detailed analysis. This enlargement helps them to see small features, like minutiae (bifurcations, ridge endings, dots), that are crucial for comparing fingerprints and making identifications. By examining these details more closely, they can increase the accuracy of matching prints found at a crime scene with those in databases or suspect samples. This process can be essential for solving crimes and ensuring the right individual is identified.

How are fingerprints used in criminal investigations and forensic science?

Fingerprints are used to identify suspects and link them to crime scenes. They are collected from surfaces where suspects may have touched and are compared to known standards, obtained from specific individuals or from a database search.

For more information, visit ForensicCOE.org or email us a ForensicCOE@rti.org.

The Forensic Technology Center of Excellence (FTCOE), led by RTI International, is supported through a Cooperative Agreement from the National Institute of Justice (15PNIJ-21-GK-02192-MUMU), Office of Justice Programs, U.S. Department of Justice. Neither the U.S. Department of Justice nor any of its components operate, control, are responsible for, or necessarily endorse, this printed material.