curious minds
Discover STEM

Classroom Resource

Investigating Fingerprints

Science Foundation Ireland sfi For what's next

Investigation

Fingerprints

Class Level - Junior

Curriculum Links

Strand:	Living things
Strand Unit:	Myself
Curriculum Objectives:	Recognise and/or measure physical similarities and differences between individuals
Skills Development:	Working scientifically (investigating and experimenting)
New words / vocabulary:	Classify
Focail nua:	Méarlorg (fingerprints), Coir (crime)
Cross curricular links:	Maths
Equipment / materials	Pencils & clear sticky tape and scissors or stamp pad, white paper, marker pen, magnifying glass, post its – one per student

Engage

Trigger questions:

- Use images of a fingerprint in ink, and fingerprints on glass.
- What are fingerprints?
- Do fingerprints change as we grow?
- Do we each have the same fingerprints?
- What happens our fingerprints if we get a cut? (The skin will heal in the same pattern as the original fingerprint)
- How can we record our fingerprints? Why would we need to do this?
- Bring in a glass jar labelled 'biscuits' - and explain that someone has eaten the contents - how could we identify the culprit?

Background information:

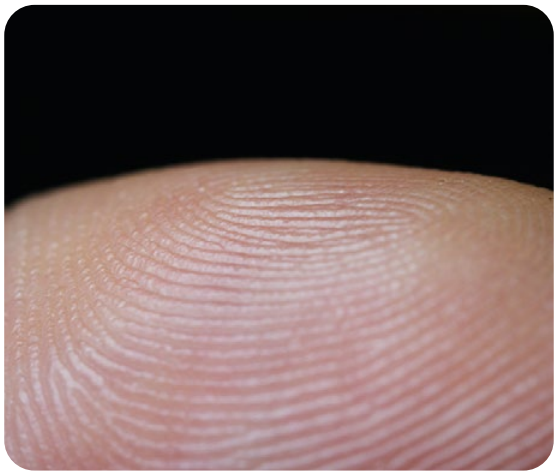
Everybody's fingerprints are different. We leave our fingerprints behind on all surfaces we touch, regardless of how clean our hands are or how much pressure we put on the surface.

While all fingerprints differ, they can be grouped into three main categories: loops, whorls and arches.

Loops are the most common, featuring in approximately 65% of prints, followed by whorls at 30%, and arches account for 5%.

Real-world application:

When solving crimes, investigators will be looking for evidence that humans leave behind to help them solve the crime e.g., skin cells, hair, fingerprints. Fingerprint science greatly helps the Gardaí and other investigators around the world in solving crimes.



Investigate

Starter question:

- Are all fingerprints the same?
- Do we have the same fingerprints on each finger and thumb?

Predicting:

Will all learners in the class have different patterns on their fingers? Will we be able to note the differences between fingerprints? Can learners predict how many loops, arches and whorls they will have/ the group will have overall?

Conducting the investigation:

Each learner records their own fingerprints and inspects them:

- Use a pencil to scribble on a small area of piece of paper, ensuring that it is large enough to roll your fingertip pad on.
- Rub this pencilled area with your finger, ensuring you use the entire front pad of the finger, not just the tip, rolling from side to side.
- Cut small pieces of clear tape.
- When the finger is black, press stained fingertip. Use a pencil to scribble on a small area of piece of paper, ensuring that it is large enough to roll your fingertip pad on.
- Rub this pencilled area with your finger, ensuring you use the entire front pad of the finger, not just the tip, rolling from side to side.
- Cut small pieces of clear tape. When the finger is black, press stained fingertip firmly to the sticky side of the clear tape (template available below).
- Stick the tape onto white paper and you should see the fingerprint. Alternatively, learners can place their finger onto the ink of a stamp pad and then lightly press their finger onto a piece of paper.
- Using a magnifying glass look at the print. Can learners identify loops, whorls and arches? Learners can make notes of the features and patterns they found on their own print in a copybook, or the template provided.

Working in pairs, learners can compare fingerprints, noting which patterns are shared and which are different. If there are shared patterns, are they found in the same area of the print? Can they tell that the two fingerprints are different from each other? Why would this be useful?

Sharing results/data:

As a class, learners can gather all the data and create a pictogram displaying how many loops, whorls and arches could be found in the class group.

Learners can discuss the differences and similarities between the prints in their pairs.

Learners can calculate the average amount of each fingerprint feature found in the class group and rank from most to least common type.

loop

arch

whorl

Take the Next Step

Adapt for home:

Are your fingerprints similar to those of your relatives? Note how they are similar/different.

Adapt for senior level:

Fingerprint CSI: Learners record their fingerprints on a blank sheet of paper and write their names on a post it, which they attach to the back of their fingerprint.

The teacher splits the class into teams of investigators. The teacher takes the prints from each group, selects one, makes a note of the learners name it belongs to, and hands it to another group without the post it attached. This is done for all groups, until all teams have a fingerprint to examine. The groups must then identify the suspect by collecting new fingerprints and examining them. Nobody in the group should know who the suspect is until they are identified through the patterns of their fingerprints. The teacher can let the learners know if they have identified the right suspect.

Each group of investigators present their findings to the class stating which patterns or features of the fingerprint allowed them to make a match. Each team can discuss what they found difficult, what they would improve on next time and what they found worked well.

When all suspects have been identified, discuss how investigators use fingerprints in crime scenes. How do they store the fingerprints? Could a system be put in place to sort and classify the prints according to the patterns on each? Would this make it easier and faster to find the suspect?

Follow-up challenge/project/citizen science link:

- **Dusting for fingerprints**

  Materials: A glass or lunchbox, hand cream, cocoa powder, corn-starch or baby powder, clear sticky tape, a paintbrush or make up brush, white paper.

  Learners rub their fingers with a small amount of hand cream and allow time for it to be absorbed. Each learner then presses the pad of their index finger onto a glass/bottom of a lunchbox. Lightly dust the fingerprint with powder, gently brushing with a soft makeup brush and baby powder to reveal a print.

  Take care to avoid inhaling the powder used. Use tape to lift the print and place it on a white sheet to examine and label. Can the learners match this fingerprint to the one they made earlier?

  This activity is latent fingerprinting- locating, preserving, and identifying impressions left by a culprit at the scene of a crime, except this time, the prints belong to young scientists!

Name: _____ **Date:** _____

Fingerprint recording template

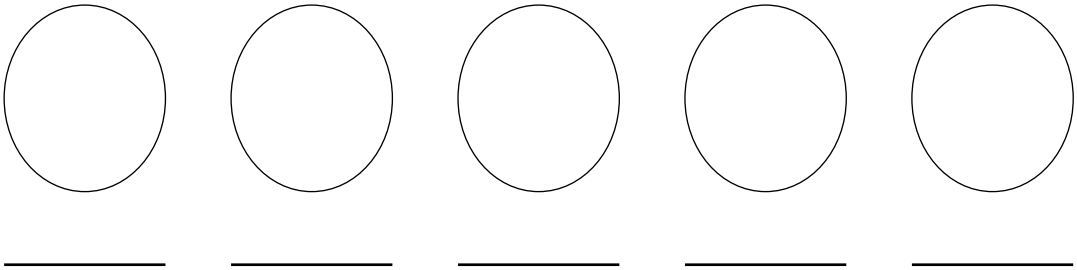
These are the three basic types of fingerprints.

arch

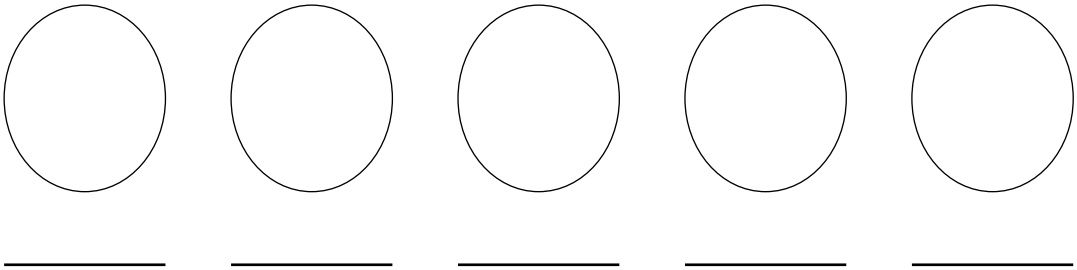
loop

whorl

My left hand



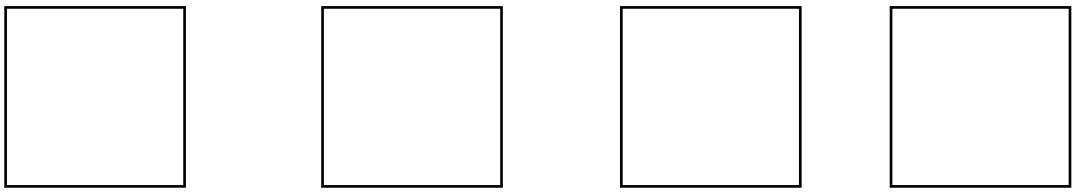
My right hand



1. I have _____ arches _____ loops _____ whorls

This is the right thumbprint of:

Mystery Print!



_____ (Name)

_____ (Name)

_____ (Name)

_____ ?

2. I think the mystery print belongs to: _____