

# DETECTIVE NOTES

## Case File: 06



# Footwear Impressions

### Key Questions:

- What are class and accidental characteristics?
- How can police use footwear impressions to help solve crimes?

### Desired Outcomes:

- Students can describe what accidental and class characteristics are.
- Students can explain how footwear impressions can help solve crimes.

### Activities and Timelines (30 minutes)

Introduction	15 minutes
Analyzing Our Shoes	5 minutes
Characteristics and Forensics Discussion	10 minutes

Main Activities	10 minutes
Class and Accidental Characteristics Game	10 minutes

Conclusion	5 minutes
Impression Labelling and Video	

### Resources

- Resource 6-1: Footwear Impression Forensics video

### Extension Activity

- Speed and direction activity

## Introduction

15 minutes

Analyzing Our Shoes	5 minutes
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#### Materials:

- ▷ Wax crayons
- ▷ White paper and pencils for each student
- ▷ Students' shoes- if shoes are dirty or wet on the bottom, they should be wiped off with paper towel

- **Explain** to the students that they will be learning about footwear impressions and how footwear impressions can help police solve crimes.
- **Explain** to the students that everyone's shoes are unique. Even those shoes of the same brand and style have characteristics that are unique to the person wearing them.
- **Ask** students to remove one of their shoes and examine the bottom.



- **Hand out** wax crayons and a piece of white paper to the students.
- **Instruct** the students to place the white piece of paper on the bottom of their shoe. Gently colour the crayon over the white paper, revealing the bottom of their shoe.
- **Ask** students to examine their wax crayon rubbing. Have them to write down words that best describe their shoes or characteristics about their shoes they can see that makes their shoes unique somewhere on the piece of paper. Such as size, brand, colour, noticeable scuff marks, etc.

### Characteristics and Forensics Discussion

10 minutes

- **Share** the following definitions:
  - ▷ **CLASS CHARACTERISTICS** are features which are common to all objects of the same variety. For a shoe, it would be the size, tread, brand, the colour, the material used to make the shoe etc.
  - ▷ **ACCIDENTAL CHARACTERISTICS** are unique characteristics. Relating to shoes, it would be some-thing that would make each person's shoe slightly different, such as worn patches, holes, scuff marks, trapped dirt, etc.
- **Ask** the students to sort their shoe descriptions into class and accidental characteristics with a partner and discuss their findings.
- **Explain** that friction also plays an important part in creating unique shoe prints.
- **Ask and discuss:** What is friction and how could it impact the bottom of someone's shoe?
  - ▷ **Definition:** Friction is a force that holds back the movement of a sliding object. The force acts in the opposite direction to the way an object wants to slide.
- **Demonstrate** friction by rubbing your hands together and encourage students to do this with you. Explain that friction is what makes your hands feel hot as they rub against one another.



**Teacher's note:** If your students have already studied the Air and Aerodynamics Unit, you can also reference friction against air molecules.

- **Explain** that friction may cause some of the sole of the shoe to wear away depending upon the surface it is on. Every time you rub, scuff, scrape, or simply walk with your shoes on, the movement causes friction between your shoe and the ground which will result in accidental characteristics. Everyone walks differently and this creates unique scuff patterns. Officers can use these characteristics to make matches.
- **Fun fact:** even if a suspect claims that a pair of shoes does not belong to them, or if shoes are found in a place not directly connected to any specific suspect (like a dumpster), police can look at details of scuff patterns and where each toe sits inside the shoes to help identify who wears them.
- **Ask and discuss:** Would two people with the same shoe and same size foot leave the same or different footprint?
  - ▷ Answer: Different footprints. The accidental characteristics would be unique to each person.
- **Ask and discuss:** How do accidental characteristics help police officers link shoes to a crime?
  - ▷ First and foremost, it places the shoes at the crime scene. Police officers can compare the impressions found at the crime scene to the shoes of various suspects to see if they can be linked to the scene.
  - ▷ The impressions can tell us the path taken by the suspect(s). The number of different types of impressions can also give clues as how many offenders may have been there.
  - ▷ The distance between the footwear impressions may assist in determining the pace of the suspect(s). Footwear impressions will be closer together when moving slowly and further apart the faster you move.



## Main Activity

10 minutes

- **Explain:** We are going to play a game to identify some characteristics in our class. I'm going to ask you all to stand in a line at one end of the classroom (this game can be played in the classroom or outside, depending on space). I'm going to call out a characteristic of people in the class. If it is something that applies to you, you must move to the other side of the room.
- **Ask** with each characteristic: Is this a class or accidental characteristic?



**Teacher's note:** Call out a common class characteristic (example: brown hair). Any person that shares that characteristic walks to the other side of the area, and any person that does not share that characteristic stays where they are.

- **Call out** the following (or use your own):
  - ▷ Natural hair (class characteristic)
  - ▷ Coloured hair (accidental characteristic)
  - ▷ Blue jeans (class characteristic)
  - ▷ Blue jeans with a hole (accidental characteristic)
  - ▷ Running shoes (class characteristic)
  - ▷ Running shoes with a scuff mark (accidental characteristic)



**Teacher's note:** Play a few rounds. Additionally, you could call on students to choose their own class or accidental characteristic that they possess. If you are unable to ask students to move to a different space to play this game, it could also be played with the students sitting at their desk. If they possess a characteristic that you call out, they could simply stand up, or stay sitting, instead of moving to the other side of the room.

## Conclusion

5 minutes

- **Ask** students to circle and label 3 class characteristics and 3 accidental characteristics on their shoe rubbing.
- **Watch** Resource 6-1: Footwear Impression Forensics Video, and discuss the real life applications of foot-wear analysis that are shown in the video.

Optional Extension Activity: Speed and Direction

30 minutes

- **Objective:**
  - ▷ To identify the direction and speed of travel of footwear prints.
  - ▷ To identify the shoe that was used to leave the prints.
  - ▷ To better understand the importance of not contaminating a crime scene and disturbing where footwear prints/ impressions are left behind.
- **Materials:**
  - ▷ Multiple pairs of shoes
  - ▷ Water (spray bottle)
  - ▷ Washable paint or chalk
- **Teacher Prep:**
  - ▷ Collect shoes
  - ▷ Set up foot impression course

- Take multiple pairs of shoes of similar profile and style (example: running shoes). Go outside and pick only 1 pair of shoes to wear.



- Put the shoes on and spray or dip the bottom of the shoe in water, chalk or washable paint (water may dry quickly depending on the environment - chalk is the first recommendation!).
- Travel around a paved area and intermittently switch directions and speed of travel (running, walking, etc).
- After completing a course take off the shoes and place them with the rest of the shoes. If washable paint or chalk was used, it will need to be wiped off!
- Now, introduce your students to the area and allow them to examine the area without disturbing the footwear prints.
- Challenge your students to see if they can determine the correct course of travel. Challenge students to also see if they can deduce at which points you changed direction and started to run vs. walk.
- Finally, given the students an opportunity to select the correct shoes that you used from the ones that you brought.
- For an additional activity, students could use chalk or water to make their own footprints and experiment with different speeds and directions of movement.



**Teacher's note:** Depending on the time of year this activity can be completed when there is fresh/thick snow on the ground or when mud. This way students can follow the shoe prints in the snow or mud to identify the shoe, direction of travel, and speed.

## Curriculum Links

### Science: Evidence and Investigation

#### *General Learner Expectations:*

- 6-8: Apply observation and inference skills to recognize and interpret patterns and to distinguish a specific pattern from a group of similar patterns.
- 6-9: Apply knowledge of the properties and interactions of materials to the investigation and identification of a material sample.

#### *Specific Learner Expectations:*

- SLE 1: Recognize evidence of recent human activity.
- SLE 2: Observe a set of footprints, and infer the direction and speed of travel
- SLE 3: Recognize that evidence found at the scene of an activity may have unique characteristics that allow an investigator to make inferences about the participants and the nature of the activity and give examples of how specific evidence may be used.
- SLE 4: Investigate evidence and link it to a possible source: e.g. by: classifying footprints

