International Baccalaureate
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Marietta City Schools

2024–2025 District Unit Planner

MARIETTA CITY SCHOOLS

Grade & Course: Forensic Science	**Topic:** Unit 4 Fingering printing, impressions, tool marks	**Duration:** 4 weeks
Teachers: Forensic PLC Teachers		

Georgia Standards and Content:

SFS4. Obtain, evaluate, and communicate information to analyze the role of impression evidence in order to make a physical match examination.

a. Construct an explanation for utilizing the appropriate technique to lift and evaluate identifiable, latent, plastic and patent fingerprints. (Clarification statement: Classifying print and minutiae patterns are addressed in this element. Students should be able to explain why they are using a specific technique.)

b. Analyze and interpret data regarding impression evidence. (Clarification statement: Impression evidence could include ballistics, tool marks, footwear, tire impressions, etc.).

c. Construct an explanation to support the significance of impression evidence in an investigation.

Narrative / Background Information

Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT)

Students have previously been told the history of the Bertillon system and why fingerprinting was necessary.

Year-Long Anchoring Phenomena: (LEARNING PROCESS)

An unidentified body was found in the back seat of a wrecked vehicle where the driver had fled the scene and the passenger was injured.

Unit Phenomena (LEARNING PROCESS)

William West was booked into a federal prison in Leavenworth, Kansas. To much surprise his name, Bertillon measurements, and resemblance matched a man already incarcerated.

Inquiry Statement:

Locard's Principle suggests that the perpetrator always leaves something behind in a crime scene.

Global Context:

Scientific and Technical Innovation

Science & Engineering Practices:

- Constructing Explanations
- Analyze and Interpret Data
- Construct an Explanation

Disciplinary Core Ideas: (KNOWLEDGE & SKILLS)

- History of impression evidence
- Characteristics of impression evidence
- Collecting impression evidence
- Forensic Analysis of impression evidence.

Crosscutting Concepts: (KNOWLEDGE & SKILLS)

- Patterns

Key and Related Concepts:

- Relationships

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)

Students may believe that identical twins have identical fingerprints.

Advanced computer technology provides additional support in identifying fingerprints, however, a scientist (human) is who identifies the final match in fingerprinting rather than the computer.

Key Vocabulary: (KNOWLEDGE & SKILLS)

Fingerprint
Ridge patterns
Loops
Whorls
Arches

Patent fingerprints
Latent fingerprints
Plastic fingerprints

Inquiry Questions:

Factual -

A fingerprint is what type of evidence?

What type of fingerprint patterns exist?

How many minutiae points can a finger have?

What is the difference between patent, latent, and plastic prints?

What surfaces are porous and which are non-porous?

Are toolmarks, ballistics, and footwear evidence class or individual evidence?

Are fingerprints class or individual evidence?

What are the percentages of loops, whorls, and arches in the U.S. population?

What is oblique lighting?

What information can be found on the headstamp of a firearm cartridge?

What are the parts of a firearm?

What is the breechblock on a firearm?

What is a cartridge?

What is firearm and ballistic evidence?

What are the different types of firearms?

What is GSR?

What is impressive evidence?

Conceptual –

How do you collect patent, latent, and plastic prints as forensic evidence?

How do you use iodine, superglue, and ninhydrin fuming techniques to collect latent prints?

What type of tool made the mark on the substrate?

How are tools used to make indentations, abrasions, and cuts that are used as evidence?

How do we collect toolmark evidence?

How do we collect firearms and ballistics evidence?

How do we collect footwear evidence?

How is oblique lighting used to enhance impressions in evidence collection?

Why would it be inappropriate to fit a suspect's tool into an impression from a crime scene to see if it matches?

How can a toolmark analysis be subjective? How can it be objective?

How do you calculate the height that a shooter was located in a building if you know the entrance and exit wound locations of a bullet on a victim and the distance from where the bullet was shot?

How are lands and grooves on spent projectiles used as evidence?

How do you determine the caliber of a bullet?

Where can GSR be found?

How can Gun Shot Residue be collected as evidence?

How do you estimate height based on shoe size?

What characteristics can you describe from your impression evidence?

Is impression evidence class or individual evidence?

How do you cast an impression with dental stone?

How can impression evidence be collected?

How can impression evidence be analyzed?

How can tire tracks be collected and analyzed as forensic evidence?

How can bite marks be analyzed as forensic evidence?

Is it possible to determine the time impression evidence was left at the scene of a crime? Why or why not?

Debatable -

How much impression evidence is found at crime scenes and is usable to convict an individual of a crime?

A prosecutor tried to convince the jury that the defendant was guilty because he owned a hammer that produced an impression similar to that found at the crime scene. As the defendant's attorney, how could you argue that matching a tool to crime-scene impressions was insufficient evidence to convict?

Which suspect can be linked to the scene of the crime?

Is estimating height based on shoe size accurate? Why or why not?

Summative assessment

Unit Objectives:

Learning Activities and Experiences	Inquiry & Obtain: (LEARNING PROCESS)	Evaluate: (LEARNING PROCESS)	Communicate: (LEARNING PROCESS)
Week 1:	**Phenomenon:** William West was booked into a federal prison in Leavenworth, Kansas. To much surprise his name, Bertillon measurements, and resemblance matched a man already incarcerated. Fingerprint Analysis ● Fingerprint Exploration • Using fingerprinting cards to explore the percentage of fingerprint patterns in the class to compare to US data.	● Latent Fingerprinting Lab Day 1 (2 days) Includes dusting, superglue, and iodine techniques with Ninhydrin and Crystal Violet as Demos	● Fingerprinting Lab Day 2 ● Fingerprinting Notes ● Fingerprinting Closer Quiz

Week 2:	**Phenomenon:** Sandra Duyst's death was classified as a suicide. Upon autopsy, the medical examiner ruled her death a homicide. Toolmarks ● Toolmarks Notes ● Toolmarks Analysis Lab Day 1 (From Bertino 2nd Ed.)	● Toolmarks Lab Day 2 ● Lab Discussion	**Phenomenon:** In the case of the deaths of Nicole Brown Simpson and Ronald Goldman, a pair of Bruno Magli shoes worn by an individual at the scene of the crime left bloody footprints as evidence. Firearms & Ballistics ● Firearms & Ballistics Notes ● Ballistics Lab Day 1
Week 3:	● Ballistics Lab: Day 2 ● Lab Discussion	**Phenomenon:** Helle Crafts went missing after a trip to Germany. It was later found that her body had been fed through a wood chipper into a river nearby. Footwear Analysis: Day 1 ● Impression Notes ● Footwear Analysis Lab (Includes shoe polish & dental stone)	
Week 4:	Footwear Analysis: Day 2 ● Footprint Residue Lifters Demo ● Take lab data from Footwear Analysis Lab- Dental Stone part D. ● Lab Discussion	Review Kahoot	Unit 4 Test

Resources (hyperlink to model lessons and/or resources):

● Textbook Forensic Science Bertino & Bertino, 3rd Edition

● Forensic Science Schoology Course
● Additional resources can be found in the common Schoology group under the Unit 4 folder.

Reflection: Considering the planning, process and impact of the inquiry

Prior to teaching the unit	During teaching	After teaching the unit
We know that student lab skills are lacking so demonstration of technique will be required prior to students carrying out the lab activities. Be sure to follow safety protocols for superglue and ninhydrin fuming.		

There is some math in this unit. Check on the math skills of the students (trigonometry) before teaching ballistics. Scaffolding may be needed. (SIN/COS/TAN) (SOH CAH TOA) Based on actual usage in the lab, we will need to modify the footwear lab for part D to only use 1lb of dental stone with 207ml of water as 2lbs and 414 ml of water produced more dental stone than each group needed. Need to purchase more trays and sand for students to complete individual casts. Fingerprinting is messy. Need to purchase plastic table cloths as well as larger mouth containers for magnetic powder and larger kit boxes to store fingerprinting supplies for each group.		