

Grade & Course: Forensic Science	Topic: Unit 3: Physical Evidence- Hair, Fiber, Soil Glass Analysis	Duration: 5 Weeks
Teachers: Forensic Science Teachers		
<p>Georgia Standards and Content: SFS2. Obtain, evaluate, and communicate information on various scientific techniques to analyze physical, trace, and digital evidence. b. Plan and carry out an investigation to analyze the morphology and types of hair, fibers, soil and glass evidence in order to make a physical match examination. e. Ask questions to determine the appropriate uses of chromatography and spectroscopy in evidence analysis. <i>(Clarification statement: Addressing spectroscopy at an analytical chemistry level is not required.)</i></p>		
Narrative / Background Information		
<p>Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT) Students should be familiar with the history of Forensics as well as how to process a crime scene. This processing includes the collecting of trace evidence such as hair, fibers, and soil.</p>		
<p>Year-Long Anchoring Phenomena: (LEARNING PROCESS) An unidentified body was found in an abandoned Connex container in a shipping yard.</p>		
<p>Unit Phenomena (LEARNING PROCESS) Fibers found on victims bodies in the Atlanta Child murder case lead investigators to a common location</p>		
<p>Inquiry Statement: Locard’s Exchange Principle dictates that evidence, both physical and biological, is to be found at the scene of the crime.</p>		
<p>Global Context: Scientific and Technical Innovation</p>		
<p>Science & Engineering Practices:</p> <ul style="list-style-type: none"> ● Planning and Carrying Out An Investigation ● Asking Questions 	<p>Disciplinary Core Ideas: (KNOWLEDGE & SKILLS)</p> <ul style="list-style-type: none"> ● History of Hair, Fiber, Soil, Glass Analysis ● Characteristics of Hair, Fiber, Soil, Glass ● Collecting Hair, Fiber, Soil, Glass Evidence ● Forensic Analysis of Hair, Fibers, Soil, & Glass 	<p>Crosscutting Concepts: (KNOWLEDGE & SKILLS) Patterns</p> <hr/> <p>Key and Related Concepts: Patterns Scientific and Technical Innovation</p>
<p>Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT) Students may believe that hair and fiber evidence can positively identify an individual linked to a crime, however, this evidence is most often class evidence. Another misconception may be that hair alone can convict a criminal. Students may think that fibers only include clothing and not other natural fibers. Overall, students may think that these forms of trace evidence are a highly used and always informative way to solve a crime when , in reality, many times are not available and not useful.</p> <p>Key Vocabulary: (KNOWLEDGE & SKILLS) comparison microscope cortex cuticle gas chromatography hair follicle</p>		

hair shaft
isotope
isotope signature
isotope-ratio mass spectrometry (IRMS)
keratin
medulla
melanin granules
mitochondrial DNA (mtDNA)
nuclear DNA
neutron activation analysis (NAA)
amorphous
crystalline
direct transfer
fiber
infrared microscope
mineral fiber
monomer
natural fiber
polarizing microscope
polymer
clay
crystal
fragment
geology
humus
mineral
organic material
sand
sediment
silt
soil
soil profile
weathering
backscatter
Becke line
bullet-resistant ("bulletproof") glass
concentric fracture
conchoidal fractures
density
glass
laminated glass
lead glass (crystal)
normal line
radial (radiating) fracture
refraction
refractive index
silicon dioxide (SiO₂)
tempered glass

Inquiry Questions:

Factual -

What are some of the differences between human and animal hair?

What are some differences between different types of fibers?

What are the different characteristics of different types of soil?

What types of glass are used in different products?

Conceptual –

Can it ever be stated with certainty that a fiber originated from a particular garment?

When can hair be used as individual evidence?

How can glass fractures give information about impact?

Debatable -

Is trace evidence important to solve criminal cases?

How much error is involved in measuring the diameter of hair samples?

Summative assessment

Unit Objectives:

Learning Activities and Experiences	Inquiry & Obtain: (LEARNING PROCESS)	Evaluate: (LEARNING PROCESS)	Communicate: (LEARNING PROCESS)
Week 1:	<p>Phenomenon: Fibers found on victims bodies in the Atlanta Child murder case lead investigators to a common location.</p> <p>Hair Analysis Notes (I Do) (Bertino Chapters 3)</p>	Hair Analysis Exploration (We Do Together)	Hair Analysis Exploration Day 2 (We Do Together)
Week 2:	Fiber Analysis Notes (Bertino chapter 4)	Hair and Fiber Analysis Lab (Ward's Kit) (We Do Together/You Do)	Hair and Fiber Analysis Day 2
Week 3:	Soil Analysis Notes (I Do)	Soil Analysis Lab exploration (Bertino Chapter 13 & 15) (We Do Together)	
Week 4:	Glass Analysis Notes (I Do)	Glass fracture patterns activity (We Do Together)	

Week 5:	Mass Spectrometry Tutorial and data analysis (We Do Together)	Review	Unit 3 Test (You Do)
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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 3 folder.

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

Prior to teaching the unit	During teaching	After teaching the unit
<p>How can we scaffold the activities for our lowest level learners? Print out required elements of notes to aid in labs and assessments.</p> <p>What activities can we offer for the students who are absent? Alternative assignments or additional time for labs as needed.</p> <p>How can we modify the lab kits from Ward's? Plan to make prepared slides of hair as students have already prepared slides from the Hair Exploration Lab.</p>	<p>Remediation for Hair & Fiber: <u>Hair Exploration</u>- Participation Grade (Anyone absent Excused)</p> <p>Hair & Fiber Analysis Lab- Required (Materials will be adjusted, by creating some prepared slides. This is to reduce amount of time needed to complete the lab)</p> <ul style="list-style-type: none"> - Students will prepare at least 1 slide of hair & fiber. - Students have until end of Unit to make up. 	<p><u>Hair Exploration Lab:</u> - Took 2 Days</p> <p><u>Hair & Fiber Analysis Lab:</u></p> <ul style="list-style-type: none"> * Took 3 Days * Add description to columns in the tables. * Remediation for Lab: Hair and Fiber Questions via schoology * Need to select new teachers for hair samples. * Print directions for the lab to minimize document length and confusion. * Modify directions for calculating diameter using a pointer and micrometer. * 4x Objective Length 2100 Micrometers <p><u>Hair/Fiber Closer</u></p> <ul style="list-style-type: none"> * Beaten by a Hair - Forensic Files <p><u>Glass Density Lab</u></p> <ul style="list-style-type: none"> * 1 Day to complete <p><u>Soil Closer</u></p> <p>Grounds for Indictment - Forensic Files</p>

