Unit 2: Soil Analysis

Content Area: **Science**
Course(s):
Time Period: **Marking Period 3**
Length: **3 weeks**
Status: **Published**

Brief Summary of Unit

The focus of this unit is an introduction to the viability of soil as a form of forensic evidence. Proper collection and analysis techniques for soil analysis are introduced and practiced as students recognize the multifaceted applications of soil analysis as a prevalent type of evidence. Students will practice conducting a thorough analysis of soil samples ranging from chemical, physical, and biological characteristics. Through analysis connections will be made to the influences of environmental factors such as climate change on soil formation and characteristics. Students will also consider the types of information that can be obtained from a soil sample, modeling how it could be used during an investigation.

Revised: July 2023

Essential Questions/Enduring Understandings

Essential Questions

- What can be determined from soil evidence and what is its value?
- Name and describe the forensic properties of soil?
- Name and describe methods utilized to collect and compare soil evidence.
- How can the chemical and physical properties of soil be utilized to determine the forensic relevance of a soil sample?

Enduring Understandings

- Students are able to perform tests and conduct analyses of the physical and chemical properties of soil to determine the forensic relevance of samples.
- Students are able to demonstrate with data the grounds for two samples originating from the same or different sources by using chemical and physical characteristics.

Objectives

- Students will know how soil is formed and the impacts of environment and climate influences on soil formation.
- Students will know the three main soil textures and will be able to utilize the soil triangle to discern textures that are a hybrid of the main three textures.
- Students will know the main physical characteristics of soil and will be able to identify them in specimens where appropriate.

- Students will know the relevance and applicability of soil evidence to aid in investigations.

- Students will be skilled at comparing the physical features of multiple soil specimens to each other.
- Students will be skilled at using microscopes to conduct a microscopic analysis of soil specimens.
- Students will be skilled at conducting a comparison for origin between soil samples.
- Students will be skilled at obtaining a soil sample from a crime scene.
- Students will be skilled at evaluating the value of soil evidence via its prevalence at crime scenes and the transferability between the scene and criminal.

Learning Plan

- Preview essential questions and connect to learning throughout the unit.
- Establish prior knowledge and understanding prior to the start of the unit.
- Introduction to the material via direct instruction with the use of Google Slides presentations and infographics.
- Participate in demonstrations and activities that build upon information delivered via direct instruction.
- Practice hands-on learning by having students practice proper soil collection and bring in their own soil samples for analysis.
- Demonstrate the vast variety and differences between soil within a relatively small geographic area with the student-brought samples.
- Locate and consider case studies where soil analysis and evidence are utilized.
- Participate in multiple laboratory activities that involve the analysis and consideration of soil specimens
    - Potential lab activities--> Visual comparison of soil samples, comparison of macroscopic features/characteristics, microscopic analysis, biological elements, chemical elements, etc.
    - Students will wear gloves and protective eye ware (safety goggles) where appropriate. They will adhere to the proper protocol to ensure safety and success & be reminded of the location of key safety features in the classroom.
- Watch an episode of Forensic Files that demonstrates how soil evidence and analysis are used to investigate and solve a crime.
- Develop a complex understanding of how soil evidence and analysis can be used to resolve an investigation.

Assessment

Formative

- Do Now Questions
- Exit Ticket Questions
- Whole class discussion participation

- Small group discussion participation
- Individual student questions/responses
- Independent tasks
- Lab experiments
- Quizzes

Summative

- Unit test
- Lab activities throughout the unit
    - Analyzing Local Soil Samples Lab (Physical Properties)
    - Microscopic Soil Analysis Lab
    - Determining Crime Scene Soil Sample Match Lab

Benchmark

- Final Exam

Alternative Assessments

- Open note test
- Project on soil-->Create your own case study

Materials

- Forensic Science, An Introduction by Roy Saferstein textbook
- Soil Analysis Google Slides
- Assorted episodes of Forensic Files & CSI Season 1
- Lab materials

Standards

PS1.B	Chemical Reactions
LA.L.11-12.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
LA.L.11-12.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, choosing flexibly from a range of strategies.
	Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.
	Using Mathematics and Computational Thinking
	Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and

	designs.
	Communicate scientific ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).
HS-ESS2-2	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
ESS2.D	Weather and Climate
	The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's reradiation into space.
HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
ETS1.B	Developing Possible Solutions
	When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.
HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.
ETS1.B	Developing Possible Solutions
	When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.
ESS3.D	Global Climate Change

Integrated Accommodations

https://docs.google.com/spreadsheets/d/1bNVkTLbqLR5r3E-ETSqwadv_OtCH2l2X-BUSpTi9kCQ/edit?usp=sharing