Lindenwold Public Schools

Unit 2: Analysis of Hair, Fiber, and Trace Evidence
29 instructional days

Targeted Standards

HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)

Disciplinary Core Ideas

LS1.A: Structure and Function

Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)

All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. (HS-LS1-1)

Crosscutting Concepts

Structure and Function

Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

Rationale and Transfer Goals:

Once evidence is collected from the crime scene it must be analyzed at the crime lab. Microscopy is used to identify and classify different hairs and fibers. The student will describe proper technique for proper collection and preservation of hairs and fibers, along with being able to describe the differences between animal, human, and synthetic hair and fibers. With a focus on the training they have received in general chemistry, students will exercise chemical methods that are used to separate and identify components of metals and paints. Soil contains inorganic crushed rocks and minerals and organic decayed plant matter and animal material (much of which has been studied in general biology). These components can help identify a location. Glass can be classified by its components which include color, dimension and thickness, density and

refractive index. The direction of force and determination of sequence can also be analyzed for glass. The student will demonstrate proper technique for collection and preservation of glass evidence while. All techniques will focus on proper laboratory training and safety.

Enduring Understandings:

Class Evidence such as hair and fiber is used to match individuals to crime scenes. Class evidence is not unique to individuals but is used with statistical analysis to place individuals at the crime scene.

Hair can be used to analyze for drugs and poisons

Fibers can be identified and characterized by chemical and physical properties

Essential Questions:

Can class evidence alone identify a criminal? What other types of evidence may be helpful?

What information can hair provide?

How are fibers used to link suspects to the crime scene or victims?

Content/Objectives		Instructional Actions	
Content ***What students will know***	**Skills** ***What students will be able to do***	**Activities/Strategies** ***How we teach content and skills***	**Evidence (Assessments)** ***How we know students have learned***
• Trace evidence is any evidence that is too small to make physical matches but large enough to be analyzed (i.e. powders, metals, paint, lipstick). • The use of qualitative analysis can be used to identify unknown powders.	• Perform tests to identify chemicals • Practice safety in the science laboratory • Analyze trace evidence from case studies and devise a plan to examine it in order to solve a crime • Use a compound microscope • Record observations	• Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide students with multiple choices for how	• Activity 9.1: How well can you Identify trace evidence • Lab Activity: Analysis of white powders • Lab activity: The case of the purloined pennies • Case Study 9.2 • Lab activity: Observations of hair

• Hair is one type of class evidence • Based on the Locard Exchange Principle, hair (and other materials) can be directly transferred to other materials. • Hair can differ among individuals and animals based on texture, color, and cuticle scale patterns. • Drugs and other chemicals can be deposited into hair through the blood system. • Fibers can be identified using microscopes and by observing their chemical properties. • Certain properties of fibers help investigators determine its origins.	• Make conclusion that will help to further students' investigations • Create arguments in support of or opposition to the use of specific forensic procedures and types of evidence • Use fiber analysis data to support a claim	they can represent their understanding. • Provide opportunities for students to connect with people of similar backgrounds. • Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures. • Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understanding. • Use project-based science learning to connect science with observable phenomena. • Structure the learning around exploring or solving a social or community-based issue.	• Class discussion: Using fibers as evidence • Lab Activity: Fabric Observations • Lab Activity: Burn Tests • Lab Activity: Chemical Tests • Lab Activity: Thermal Decomposition • Quizzes • Forensics Benchmark #1

		• Provide ELL students with multiple literacy strategies. • Collaborate with after-school programs or clubs to extend learning opportunities.	

Spiraling for Mastery
Where does this unit spiral back to other units from this or previous years in order to ensure that students retain mastery of what they've learned?

Content or Skill for this Unit	Spiral Focus from Previous Unit	Instructional Activity
• Perform tests to identify chemicals • Analyze trace evidence from case studies and devise a plan to examine it in order to solve a crime • Use a compound microscope	• Physical evidence is an object or material relevant to the crime which can link a suspect or identify a person involved in a crime. • Class data can be used to narrow a suspect down to one person out of a large group of people based on known characteristics. • Information at a crime scene must be gathered in a systematic way. • Chemical methods for developing latent prints by reacting with the residue left by the finger create a visible mark.	• Lab activity: Observations of hair • Class discussion: Using fibers as evidence • Lab Activity: Fabric Observations • Lab Activity: Burn Tests

Key resources:

Lindenwold Public Schools

Trace evidence Slide Set (Ward's Natural Science)

Hair and Fiber Analysis Kit

Wards Fiber Kit

21st Century Life & Careers:

9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.

9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.

9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.

Career Readiness, Life Literacies, & Key Skills:

9.4.12.CT.3: Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).

9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other projects and determine the strategies that contribute to effective outcomes.

9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others.

9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.

9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions.

9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience.

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9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately.

9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity.

Interdisciplinary Connections/Companion Standards:

NJSLS ELA

RST.11-12.1 Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. (HS-LS1-1)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1-1)

Companion Standards for ELA in Science and Technical Subjects: Reading

Key Ideas and Details

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS1-1)

Companion Standards for ELA in Science and Technical Subjects: Writing

Text Types and Purposes

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS1-1)

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-1)