Hair/Fibers

Content Area:ScienceCourse(s):Introduction to Forensic InvestigationsTime Period:Second Marking periodLength:3 WeeksStatus:Published

Unit Overview

Forensic Science utilizes all levels of scientific inquiry, specifically chemistry and physics, to analyze physical evidence with the ultimate goal of recreating the events of the crime for a jury in a court of law. This unit focuses on glass, metal, soil, hair and fiber evidence, its collection and analysis using technology that incorporates core principles from physical/biological science. Hair and fiber are two of the most important resources in Forensic Science and are often responsible for providing valuable clues as to the identity of an assailant or attacker.

STAGE 1- DESIRED RESULTS

Standards- 2020 New Jersey Student Learning Standards- Science

SCI.9-12.HS-PS1-1	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
SCI.9-12.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.
SCI.9-12.HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
SCI.9-12.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Science and Engineering Practices

- Analyzing and Interpreting Data
- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Developing and Using Models
- Engaging in Argument from Evidence

- Obtaining, Evaluating, and Communicating Information
- Planning and Carrying Out Information
- Using Mathematics and Computational Thinking

Cross Cutting Concepts

- Cause and Effect
- Energy and Matter
- Influence of Engineering, Technology, and Science on Society and the Natural World
- Interdependence of Science, Engineering, and Technology
- Patterns
- Scale, Proportion, and Quantity
- Stability and Change
- Structure and Functions
- Systems and System Models

Disciplinary Core Ideas

Physical Sciences

• PS1B: Chemical Reactions

Life Sciences

- LS1A: Structure and Functions
- LS1B: Growth and Development of Organisms
- LS1D: Information Processing
- LS3A: Inheritance of Traits
- LS3B: Variation of traits

Earth and Space Sciences

Engineering. Technology. and Applications of Science

- ETS1B: Developing Possible Solutioins
- ETS1C: Optimizing the Design Solution

Essential Questions

- What is the value of hair and fibers as trace evidence ?
- What information can be gained by studying hair and fiber evidence ?
- How are hair and fibers analyzed in a crime lab?

Enduring Understanding

- Matter, including forensic evidence such as hair and fibers, can be described, organized, classified, and analyzed and can be used to identify suspects.
- Evidence can be analyzed for its chemical components to uncover characteristics that are not always directly observable and thus can give insight to a crime.

Students will know...

Vocabulary - comparison microscope, cortex, cuticle, gas chromatography, hair follicle, hair shaft, keratin, medulla, melanin granules, mitochondrial DNA, nuclear DNA, amorphous, crystalline, direct transfer, fiber, mineral fiber, monomer, natural fiber, polymer, secondary transer, synthetic fiber, textile, warp, weft, yarn (thread)

Misconceptions - all fibers look the same, DNA can be obtained from hair

Students will be able to...

- Analyze hair samples to reveal drugs, toxins, heavy metals and nutritional deficiencies.
- Develop an understanding that mitochondrial DNA from hair can reveal some of a suspect's or a victim's family relationships.
- Evaluate the Hair/Fibers as evidence to create a link between crime and suspect.

Formative Assessment

- 3- Minute Pause
- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Index Card Summaries
- Journal Entry
- Misconception Check
- Observation
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

Authentic Assessments

- Observation quiz, Crime scene quiz Crime Scene Sketch .
- Physical Evidence Packaging Lab.
- Chapter tests
- Science Notebook in the student Mac Air computer
- Glass Fragment Identification Lab
- Hair Identification Lab
- Fiber Identification Lab

Chapter Test on Fibers

Unit Test on Hair/Fibers

STAGE 3- LEARNING PLAN

Instructional Map

• The Structure and Functions of Hair

Types of Hair

Hair From Different Parts of the Body

Life Cycle of Hair

Animal Hair and Human Hair

Collecting Hair in an Investigation

Microscopy

- Introduction to Fiber
- Collecting, Sampling and Testing Fiber Evidence
- Evaluating Fiber Evidence

Modification/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products

- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just singlesubject areas

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials

• Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Cooperative Grouping
- Extended Time
- Frequent Breaks
- Highlighted Text
- Modified Test
- Oral Directions
- Peer Tutoring

- Preferential Seating
- Re-direct
- Repeated Drill and Practice
- Teacher Notes
- Tutorials
- Use of Additional Reference Materials
- Use of Audio Resources

Differentiation Strategies

High Preparation

- Alternative Assessments
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation

- Choice of Book / Activity
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Open-ended Activities

- Think-Pair-Share by Readiness, Interest, or Learning Style
- Use of Collaboration
- Use of Reading Buddies
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Intergration- Interdisciplinary Connections

See Appendix

Vertical Integration- Discipline Mapping

Middle School Science - Diversity of Life, Populations and Ecosystems, Human Systems Interactions, and Heredity and Adaptations

High School Biology and Chemistry - Human Body Systems (Integumentary System), analyzing data, continuing with the performance expectations outlined in the NGSS.

Additional Materials

- Autopsy of a Murder (Interactive web site) Centre des Sciences Montreal www.centredessciencesdemontreal.com/static/autopsy/flash.htm
- FBI Glass Analysis Comparison http://www.fbi.gov/about-us/lab/forensic-sciencecommunications/fsc/april2009/review/2009_04_review01.htm/
- Trace Evidence Analysis (Glass) http://www.crimemuseum.org/crime-library/glass-analysis
- BI Hair Analysis http://www.fbi.gov/about-us/lab/forensic-sciencecommunications/fsc/april2009/review
- Fiber Analysis http://www.sciencedaily.com/releases/2013/10/131029133122.htm