Lindenwold Public Schools

Unit 3: Handwriting Analysis and Toxicology
23 instructional days

Targeted Standards

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.* [Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.] [Assessment Boundary: Assessment is limited to provided molecular structures of specific designed materials.]

Science and Engineering Practices

Developing and Using Models

Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

Obtaining, Evaluating, and Communicating Information

Communicate scientific and technical information (e.g. about 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-PS2-6)

Disciplinary Core Ideas

LS1.A: Structure and Function

Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)

PS2.B: Types of Interactions

Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (HS-PS2-6)

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Crosscutting Concepts

Systems and System Models

Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2)

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-PS2-6)

Rationale and Transfer Goals:

Along with other forms of trace evidence, the art of handwriting analysis provides forensic scientists another tool for detecting crimes such as fraud and forgery. Students will concentrate on identifying different characteristics found in handwriting styles, along with how to spot a forgery. Other criminal acts concerning fraud and theft will be covered during this time. Students will be expected to be able to analyze and interpret data, as well as distinguish patterns and construct explanations for what they observe in each crime scene and samples.

Illicit drugs are those that are either legitimately manufactured drugs taken for purposes other than what they were made for, or drugs that have no medical use. Illicit drugs fall into four classes by major effects. Students will name and classify commonly abused drugs, as well as compare and contrast physical and psychological drug evidence. Illicit drugs are analyzed by forensic chemists who develop protocols for analysis that take into account the form and quantity of the drug present. Students will demonstrate proper technique for collection and preservation of drug evidence. Forensic toxicologists determine the presence and amounts of drugs and poisons in people and interpret their effects.

Enduring Understandings:

Documents can be authenticated using specific unique and identifiable handwriting characteristics as well as the types of ink and paper and other artifacts from the creation process.

The concentration of a substance determines its toxicity. The same substance may be helpful or harmful to a person, depending on the dose.

Essential Questions:

What does a person's handwriting say about them?

Can an investigator use handwriting samples in a court of law?

Can handwriting samples identify a person?

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What makes a substance poisonous?

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***
• Handwriting samples show unique characteristics known as class characteristics and individual characteristics that help investigators to use samples in a court of law. • Handwriting experts examine handwriting using predetermined characteristics. • There are three types of forgery: blind, simulated and traced. • Forgeries include erasures of words or letters which are evident by examining the paper's surface. This is known as obliteration and they can either be physical or chemical. • Inks from suspected forgeries can be analyzed using the method of chromatography.	• Read and interpret tables • Practice safety in the laboratory science • Use a case study to identify the connections between hair analysis and toxicology. • Prepare tests to identify chemicals • Compare and contrast legal issues to support an opinion and defend an argument • Summarize drug analysis techniques using a case study. • Using handwriting analysis data to identify patterns • Collaborate with peers to perform an investigation • Design an experiment using the method of paper chromatography • Draw conclusions based on experimental evidence	• 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 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	• Activity 16.1 Analyze your own handwriting • Case study 16.1: Anonymous Writing • Activity 16.2: Simulated Forgery • Activity 16.3: Blind, Simulated, and Traced Forgery • Laboratory Activity- Finding erasures • Laboratory Activity- Ink comparisons Using Paper chromatography • Lab Activity- Know your money • Group research- Poison/Toxin • ab Activity- Spot Test Lab • Lab Activity- Is it Ibuprofen • Quizzes • Forensics Benchmark #2

• Counterfeiting is one of the oldest crimes in the world and has been decreasing due to changes in the materials used to create our currency. • The dosage of a substance determines whether it is poisonous and how poisonous it is. • Toxicology can be characterized based on elements such as delivery and time of exposure. • The lethal dose (LD_{50}) is used to measure toxicity. • Drugs can affect the function and structure of living systems. • The use and purchase of controlled drugs can lead to increased violence, crime and health and social problems.		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. • 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
• Counterfeiting is one of the oldest crimes in the world and has been decreasing due to changes in the materials used to create our currency	• Trace evidence is any evidence that is too small to make physical matches but	• Lab Activity- Know your money • Group research- Poison/Toxin • Lab Activity- Spot Test Lab • Lab Activity- Is it Ibuprofen

• The dosage of a substance determines whether it is poisonous and how poisonous it is • Toxicology can be characterized based on elements such as delivery and time of exposure.	large enough to be analyzed (i.e. powders, metals, paint, lipstick). • The use of qualitative analysis can be used to identify unknown powders.	

Key resources:

Document Analysis Lab Activity

Ink Chromatography Activity

Discovery Streaming: Trace evidence, Toxicology and DNA

Intro to Toxicology Lab Activity

Drug Identification Chart

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.

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 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-PS2-6)

WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS2-6)

SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-LS1-2)

NJSLS Mathematics

HSN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-PS2-6)

HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-PS2-6)

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-LS1-2)

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-LS1-2)

WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research. (HS-LS1-2)