



Greenwich Public Schools Curriculum Overview

Forensic Science II

Personalized learning is achieved through standards-based, rigorous and relevant curriculum that is aligned to digital tools and resources.

Note: Teachers retain professional discretion in how the learning is presented based on the needs and interests of their students.

Course Description

Prerequisite: Seniors (juniors may take concurrently with an NGSS-aligned course), Grade of C or better in Forensic Science.

Students will learn advanced concepts in physical and chemical analysis of evidence found at a crime scene. Core topics will concentrate on pattern analysis, ballistics, glass evidence, types of prints, toxicology, time of death, and DNA analysis. A major component of this class will be the laboratory application of concepts discussed during lecture. The rich, hands-on experience in the laboratory will focus on the analysis of evidence that would be found at crime scenes.

Unit Guide

- Unit 1: Introduction to the Forensic Science Lab
 - Observation and Measuring Techniques
 - Microscopic Techniques
 - Evidence Analysis and Reports/Case Studies
 - Technology and Instrumentation

- Unit 2: Analysis of Patterns (Two-Dimensional and Three-Dimensional)
 - Shoe/Tire Prints and Impressions
 - Tool Impressions

- Unit 3: Trace Evidence

- Hair Analysis/Fiber Analysis
- Glass Analysis
- Soil Analysis
- Paint Analysis

- Unit 4: Processing and Analysis of Prints
 - Physical and Chemical Processing of Prints
 - Analysis and Identification of Unknown Prints

- Unit 5: Manner, Cause, and Location of Death
 - Injuries/Condition of Body
 - Location and Arrangement of Body
 - Autopsy

- Unit 6: Time of Death
 - Algor mortis, Rigor mortis, Livor mortis
 - Bacterial and Insect Activity
 - Skeletal Remains

- Unit 7: Toxicology
 - Physical and Microscopic Examination of Drugs and Poisons
 - Chemical Examination of Drugs and Poisons
 - Instrumentation

Enduring Understanding and/or Performance Tasks

- **Unit 1: Introduction to the Forensic Science Lab**
 - **Enduring Understandings**
 - Analysis and Identification of forensic evidence is limited by the Qualitative and Quantitative measurements recorded
 - A protocol must be followed while analyzing forensic evidence in order to prove validity in court
 - **Performance Tasks**
 - Utilize and read measuring devices both accurately and precisely.

- Describe observations in specific details using four out of five senses (no taste).
- Record all qualitative and quantitative observations accurately for analysis purposes.
- Identify important forensic characteristics while describing evidence items.
- Utilize the three types of microscopes used in forensic analysis.
- Photograph evidence efficiently using scales and the correct type of lighting.

➤ Unit 2: Analysis of Patterns (Two-Dimensional and Three-Dimensional)

○ **Enduring Understandings**

- Pattern analysis can provide enough details to reconstruct an entire crime/crime scene.

○ **Performance Tasks**

- Identify class patterns
- Identify individualizing patterns and details within those patterns
- Document a three-dimensional pattern (impression) via photography and casting
- Reconstruct a crimes scene based on blood spatter patterns

➤ Unit 3: Trace Evidence

○ **Enduring Understandings**

- Identifying specific microscopic details within trace evidence can provide pivotal information about a crime and how it happened

○ **Performance Tasks**

- Identify the source/location that a sand sample originated from.
- Match a paint chip to a single painted surface.
- Identify an unknown hair sample as human or animal and determine which species it originated from.
- Identify an unknown fiber as synthetic or natural.
- Separate, Examine, and Identify a vacuum sweeping mixture collected at a crime scene.

➤ Unit 4: Processing and Analysis of Prints

○ **Enduring Understandings**

- Explain the history and development of fingerprints as identifying features for civil and law enforcement agencies.

- Fingerprints are unique to individuals and can be used as evidence in arguing which individuals were present at a crime scene
- **Performance Tasks**
 - Describe the concept of an automated fingerprint identification system (AFIS) and its importance to forensic investigation.
 - List and demonstrate the techniques for developing latent fingerprints on porous and nonporous objects.
 - Describe and demonstrate the proper procedures for preserving a developed latent fingerprint.
- Unit 5: Manner, Cause, and Location of Death
 - **Enduring Understandings**
 - There are several definitions of death, including the cessation of the heartbeat and brain function.
 - An autopsy is performed if a death is suspicious or unexplained.
 - **Performance Tasks**
 - Distinguish between four manners of death: natural, accidental, suicidal, homicidal
 - Distinguish between cause, manner, and mechanisms of death
- Unit 6: Time of Death
 - **Enduring Understandings**
 - A forensic entomologist studies the development of insect larvae in a body to estimate the time of death.
 - There are several definitions of death, including the cessation of the heartbeat and brain function.
 - **Performance Tasks**
 - Describe how various environmental factors may influence the estimated time of death
 - Employ autopsy report regarding stomach contents to estimate time of death
 - Explain how the development of rigor, algor and livor mortis occur
 - Employ evidence of rigor, algor and livor mortis to calculate the approximate time of death
 - Explain how time of death estimates may be linked to insect evidence
 - Provide an example of the succession of different types of insects that are found on a body as it decomposes

- Estimate time of death given insect evidence, rigor, algor and livor mortis data

➤ Unit 7: Toxicology

○ **Enduring Understandings**

- Chemical compounds are classified in the Controlled Substances Act are regulated by the United States government.
- Understand the significance of drug analysis and toxicology to forensic investigations and will be able to identify various drugs and describe methods drug analysts and toxicologists use in identifying substances.

○ **Performance Tasks**

- Identify unknown substances by utilizing a series of chemical tests of the chemical and physical properties of substances
- Explain what LD50 is and how it is determined for different substances and use it to classify how toxic a substance is
- Human metabolism of alcohol and calculation of blood alcohol content

Standards

➤ Vision of the Graduate Standards

- Pose and pursue substantive questions
 - Ask questions, based on observed phenomena and patterns, that can be answered empirically and distinguish a scientific question from a non-scientific question.
- Explore, define, and solve complex problems
 - Plan and conduct experimental procedures, identifying relevant variables and collecting appropriate data in order to identify causal relationships and make predictions.
- Critically interpret, evaluate, and synthesize information
 - Analyze data using mathematics and statistics, to look for patterns or to test whether data are consistent with a hypothesis.
- Collaborate with others to produce a unified work and/or heightened understanding
 - Use scientific evidence and models to construct explanations of phenomena or solve engineering problems.
- Communicate effectively for a given purpose

- Read, evaluate, and produce scientific texts and construct scientific arguments to communicate about science.
- Next Generation Science Standards Performance Expectations
 - Unit 1: Introduction to the Forensic Science Lab
 - PS1-1, PS1-2, PS1-3, PS1-5
 - Unit 2: Analysis of Patterns (Two-dimensional and Three-dimensional)
 - PS1-2, ETS1-2
 - Unit 3: Trace Evidence
 - LS1-1, LS1-2
 - Unit 4: Processing and Analysis of Prints
 - ETS1-1, ETS1-2, ETS1-3, LS1-1, LS1-2
 - Unit 5: Manner, Cause, and Location of Death
 - LS1-1, LS1-2
 - Unit 6: Time of Death
 - LS1-1, LS1-2
 - Unit 7: Toxicology
 - PS1-1, PS1-2, PS1-5, PS1-1, LS1-2, LS1-3

Resources and Assured Experiences

- Gizmo
- Edpuzzle
- POGIL
- Measurement Cipher Lab
- Evidence Bag Lab 01
- Physical Evidence Lab
- Case Studies
- Evidence Bag Lab 02
- Review of Fingerprint Analysis Reading with Questions
- Latent Fingerprint Processing Lab
- Toxicology Lab