High School Topics Forensic Science Curriculum

Course Description: Forensic Science is the application of science (chemistry, physics, and biology) to the criminal and civil laws that are enforced by police agencies in a criminal justice system. It includes the investigation of fingerprinting, fiber analysis, ballistics, arson, trace evidence analysis, poisons, drugs, blood spatters, and blood samples. Students are taught the proper collection, preservation, and laboratory analysis of various samples.

Scope and Sequence:

Timeframe	Unit	Instructional Topics
2 Weeks	History of Forensic Science	Topic 1: The History of Forensic Science Topic 2: Crime Lab Units and Professions
2-3 Weeks	CSI	Topic 1: The Crime Scene Topic 2: Types of Evidence Topic 3: Anthropology/Pathology
2 Weeks	Fingerprint Analysis	Topic 1: Fingerprint Classification Topic 2: Developing Fingerprints
1.5 Weeks	Toxicology	Topic 1: Classification of Drugs Topic 2: Toxicity
2-3 Weeks	Biological Evidence	Topic 1: Hair Evidence Topic 2: Fiber Evidence Topic 3: Blood Evidence

1-1.5 Weeks	Ballistics	Topic 1: Firearms
2 Weeks	Documents and Impressions	Topic 1: Impressions Topic 2: Document Analysis
1-1.5 Weeks	Forensic Science Investigation	Final Crime Scene Engaging Scenario

This document contains the entire High School Forensic Science curriculum that is taught in a regular education setting. Items that are highlighted in yellow have been designated as priority information that should be taught in the High School Topics Forensic Science class.

Unit 1: History of Forensic Science

Subject: Forensic Science
Grade: 10-12
Name of Unit: History of Forensic Science
Length of Unit: 2 weeks
Overview of Unit: Students will be introduced to some of the fundamental figures and events that shaped the course of forensic science in this unit. This will include examples such as the advent of fingerprinting, anthropometry, and blood typing. Students will also learn about the history and components of a crime lab and the professionals that are employed in those crime lab units.

Priority Standards for unit:
- N1.1 Examine the history of forensic science
- N1.2 Understand the role of forensic science in the criminal justice system
- K1.a Discuss careers available in the field of forensic science and training required for each

Supporting Standards for unit:
- ISTE - KNOWLEDGE COLLECTOR.3 Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
- ISTE-DIGITAL CITIZEN.2 Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical.

Unwrapped Concepts (Students need to know)	Unwrapped Skills (Students need to be able to do)	Bloom's Taxonomy Levels	Webb's DOK
The history of forensic science	Examine	Understand	2
The role of forensic science in the criminal justice system	Understand	Understand	2
careers available in the field of forensic science and training required for each	Discuss	Understand	2

Essential Questions:
1. How have historical figures in the field of forensic science influenced today's practice?
2. How have forensic science techniques progressed over time?
3. How are the units of a crime lab organized, and what skills would an employee need?

Enduring Understanding/Big Ideas:
1. Several figures have greatly influenced the development of new techniques and the acceptance of processes both within the scientific community and the courtroom.
2. The techniques have gotten more advanced due to breakthroughs in technology such as computers and microscopes. New types of evidence can also be collected more efficiently as is the case with DNA.
3. Crime lab units are organized by area of expertise i.e. physical science, biological, firearms. They would be responsible for analyzing evidence that falls into their respective category. An employee of these units would be required to have advanced degrees in related topics such as chemistry or biology with specialized training in forensics.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
Classification Scientific Method Evidence	Anthropometry Odontology Locard's Exchange Principle Toxicology

Topic 1: The History of Forensic Science

Engaging Experience 1

Title: Serial Killer Research Project

Suggested Length of Time: 5 blocks (2 for research, 3 for presentations), can be spaced out over the unit.

Standards Addressed

Priority:

- N1.1 Examine the history of forensic science
- N1.2 Understand the role of forensic science in the criminal justice system

Supporting:

- ISTE - KNOWLEDGE COLLECTOR.3 Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
- ISTE-DIGITAL CITIZEN.2 Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical.

Detailed Description/Instructions: Students will research a serial killer from history, such as Ted Bundy or H.H. Holmes, and give a presentation about the chosen serial killer. The presentation itself would include background information, description of the crimes committed, forensic evidence collected and presented, what the conviction was if applicable, etc. The presentations can range in length, but should be approximately 7-10 minutes. Students should include 3 different sources, one of which must not be a website.

Bloom's Levels: Understand

Webb's DOK: 2

Topic 2: Crime Lab Units and Professions

Engaging Experience 1
Title: Crime Unit Practical Exam
Suggested Length of Time: 25 minutes (modified to 1 full block)
Standards Addressed
> *Priority*:
>> ● K1.a Discuss careers available in the field of forensic science and training required for each

Detailed Description/Instructions: Create stations with 12 to 15 different types of evidence. Have students rotate through the stations and determine which crime lab unit would be responsible for analyzing the evidence presented. Possibilities include: soil, blood spatter, shoe print, hair, computer, mobile phone (voice recording), check, glass, pills, fiber, and charred material.
Bloom's Levels: Analyze
Webb's DOK: 2

Engaging Scenario

Engaging Scenario (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)
Create a timeline of major contributions to the development of Forensic Science.
Include:
1. Name of person making the contribution
2. Date (may be a rough estimate on one or two)
3. Pictures to visualize the contributions
4. Use 10 people from (make sure that the 6 names below are included)
Modification - use only six people listed below
a. Osborn
b. Bertillon
c. Goddard
d. Locard
e. Lattes
f. Galton
5. If you use people from outside resources (not the textbook) you must cite where you found the information

Rubric for Engaging Scenario:

Category	Multiplier	3 points	2 points	1 point
Timeline format with dates spaced correctly and labeled by name	X 1			
For each of the contributors (10 of them) include: Name, Year, and Contribution	X 10			
Minimum of 6 Pictures included: They can be a picture of the person, or of a tool that they used in their contribution	X 6			
Neat and well put together.	X 1			

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
The History of Forensic Science	Serial Killer Research Project	Students will research a serial killer from history such as Ted Bundy or H.H. Holmes and give a presentation about the chosen serial killer. The presentation itself would include background information, description of the crimes committed, forensic evidence collected and presented, what the conviction was if applicable, etc. The presentations can range in length, but should be approximately 7-10 minutes. Students should include 3 different sources, one of which must not be a website.	5 blocks
Crime Lab Units and Professions	Crime Unit Practical Exam	Create stations with 12 to 15 different types of evidence. Have students rotate through the stations and determine which crime lab unit would be responsible for analyzing the evidence presented. Possibilities include: soil, blood spatter, shoe print, hair, computer, mobile phone (voice recording), check, glass, pills, fiber, and charred material.	25 min (Modified to 1 block)

Unit 2: CSI

Subject: Forensic Science
Grade: 10-12
Name of Unit: CSI
Length of Unit: 2 to 3 weeks
Overview of Unit: In this unit, students will be introduced to the processes and techniques used at a crime scene, such as how to search the scene and collect evidence. This unit will also discuss the two main types of evidence that could be found. Additionally, students will learn about the role that anthropology and pathology play in determining manner and cause of death. Finally, this unit will include how the courtroom and legal processes affect evidence collection and the role expert witnesses play in the courtroom.

Priority Standards for unit:
- K2.a Differentiate procedures for securing and documenting a crime scene
- K2.b Perform evidence collection, storage and report writing.
- K1.b Distinguish individual evidence from class evidence and discuss its relevance in a court of law
- K10.a Use a human skeleton to determine gender, age range, height and race
- K10.b Predict time of death using Rigor Mortis, Algor mortis, livor mortis and stages of decomposition

Supporting Standards for unit:
- K1.c Justify use of observation skills and debate validity of eyewitness accounts of events
- ISTE - KNOWLEDGE COLLECTOR.3: Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
- TT.AB.J.13: Students will analyze the harmful impact of bias and injustice on the world, historically and today.
- TT.AB.J.15: Students will identify figures, groups, events and a variety of strategies and philosophies relevant to the history of social justice around the world.

Unwrapped Concepts (Students need to know)	Unwrapped Skills (Students need to be able to do)	Bloom's Taxonomy Levels	Webb's DOK
procedures for securing and documenting a crime scene	Differentiate	Understand	2
evidence collection, storage and report writing	Perform	Apply	3
individual evidence from class evidence	Distinguish	Understand	2

discuss its (individual evidence) relevance in a court of law	Discuss	Understand	2
a human skeleton to determine gender, age range, height and race	Use	Apply	3
Time of death using Rigor Mortis, Algor mortis, livor mortis and stages of decomposition	Predict	Apply	3

Essential Questions:
1. How should the crime scene be analyzed and documented?
2. How can evidence be classified?
3. Why are anthropology and pathology important to forensic science?

Enduring Understanding/Big Ideas:
1. Crime scene investigation is dictated by what is called the seven Ss. It includes sketching, photography, different search procedures, etc.
2. The two main categories of evidence are class and individual.
3. Anthropology and pathology help investigators determine cause of death, manner of death, gender of the victim, age, and height of the victim. This allows for a possible identification of the victim given the information.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
Investigation Suspect Victim Quadrant	Anthropology Pathology Chain of custody CSI Effect Livor mortis Rigor mortis Algor mortis Frye Standard Post-mortem interval (PMI)

Topic 1: The Crime Scene

Engaging Experience 1

Title: Documentation of a crime scene

Suggested Length of Time: 1 block (Modified to 1-2 blocks)

Standards Addressed

Priority:

- K2.a Differentiate procedures for securing and documenting a crime scene
- K2.b Perform evidence collection, storage and report writing.

Supporting:

- ISTE - KNOWLEDGE COLLECTOR.3: Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.

Detailed Description/Instructions: In this activity, students will practice the primary skills of a crime scene investigator by learning how to properly sketch a crime scene and photograph evidence.

Bloom's Levels: Apply

Webb's DOK: 4

Topic 2: Types of Evidence

Engaging Experience 1

Title: Identifying types of evidence lab

Suggested Length of Time: 30 minutes (Modified to 1 block)

Standards Addressed

> *Priority*:
> - K2.b Perform evidence collection, storage and report writing.
> - K1.b Distinguish individual evidence from class evidence and discuss its relevance in a court of law
> - K1.c Justify use of observation skills and debate validity of eyewitness accounts of events

Detailed Description/Instructions: In this activity, students will be given a multitude of different pieces of evidence and must decide what type of evidence they are. For example, is this ripped fabric class or individual evidence? The activity could also be extended to include what crime lab unit would analyze those materials, recalling information from the previous unit.

Bloom's Levels: Understand

Webb's DOK: 2

Topic 3: Anthropology/Pathology

Engaging Experience 1

Title: Bone lab

Suggested Length of Time: 30 minutes (Modified to 1 block)

Standards Addressed

Priority:

- K10.a Use a human skeleton to determine gender, age range, height and race
- K10.b Predict time of death using Rigor Mortis, Algor mortis, livor mortis and stages of decomposition

Detailed Description/Instructions: In this activity, students will attempt to identify a victim based on either images of bones or bone models utilizing different measurements and generalizations. Students can try to develop mathematical models that relate bone length with height and use this in their investigation.

Bloom's Levels: Apply

Webb's DOK: 2

Engaging Scenario

Engaging Scenario (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

Set up 2-3 scenarios outlined in crime scene tape with 4-6 pieces of evidence in each scenario. Students will be required to work as a team, choose an appropriate search scenario, identify and describe evidence within the area, and quantify it as class or individual. (modified to 1-2 scenarios with 3-5 pieces of evidence)

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
The Crime Scene	Documentation of a crime scene	In this activity, students will practice the primary skills of a crime scene investigator by learning how to properly sketch a crime scene and photograph evidence.	1 block (Modified 1-2 blocks)
Types of Evidence	Identifying types of evidence lab	In this activity, students will be given a multitude of different pieces of evidence and must decide what type of evidence they are. For example, is this ripped fabric class or individual evidence? The activity could also be extended to include what crime lab unit would analyze those materials, recalling information from the previous unit.	30 min (Modified 1 block)
Anthropology/ Pathology	Bone lab	In this activity, students will attempt to identify a victim based on either images of bones or bone models utilizing different measurements and generalizations. Students can try to develop mathematical models that relate bone length with height and use this in their investigation.	30 min (Modified 1 block)

Unit 3: Fingerprint Analysis

Subject: Forensic Science
Grade: 10-12
Name of Unit: Fingerprint Analysis
Length of Unit: 2 weeks
Overview of Unit: In this unit, students will learn about the different classifications of fingerprints such as loops, whorls, and arches. Additionally, students will be able to identify multiple ridge characteristics and forms of minutiae. Finally, students will learn and apply techniques to develop and collect fingerprints.

Priority Standards for unit:
- K3.a Develop, analyze and classify fingerprints

Supporting Standards for unit:
- ISTE-EMPOWERED LEARNER.1: Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.
- ISTE - COMPUTATIONAL THINKER.5: Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

Unwrapped Concepts (Students need to know)	Unwrapped Skills (Students need to be able to do)	Bloom's Taxonomy Levels	Webb's DOK
fingerprints	Develop	Apply	3
fingerprints	Analyze	Analyze	3
fingerprints	Classify	Evaluate	3

Essential Questions:
1. How are fingerprints classified and identified?
2. Why are there multiple methods used to develop prints?

Enduring Understanding/Big Ideas:
1. Fingerprints are classified as loops, arches, and whorls. They are further identified by matching minutiae points between the known and suspect print as well as any scars or imperfections.
2. There are multiple methods used to develop prints depending on weather the print was deposited on a porous or nonporous surface. Types of methods include iodine fuming, superglue fuming, and dusting.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
Fingerprint Core Dusting	Minutiae Ridge characteristic Bifurcation Delta Latent Patent Plastic Loop Whorl Arch Fuming Porous Non-porous AFIS Dactyloscopy

Topic 1: Fingerprint Classification

Engaging Experience 1
Title: Characterization of Student Fingerprints
Suggested Length of Time: 30 minutes (Modified 1 block)
Standards Addressed
   Priority:
   - K3.a Develop, analyze and classify fingerprints
   Supporting:
   - ISTE-EMPOWERED LEARNER.1: Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.
   - ISTE - COMPUTATIONAL THINKER.5: Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

Detailed Description/Instructions: In this activity, students will learn how to make proper fingerprints as well as classify their own prints as either arches, loops, or whorls. When good fingerprints have been made, students can try to identify different types of minutiae on their print. This can be done on paper with magnifying glasses, or they can be made on balloons and then blown up to reveal the detail.
Bloom's Levels: Analyze
Webb's DOK: 3

Topic 2: Developing Fingerprints

Engaging Experience 1

Title: Dusting for Fingerprints

Suggested Length of Time: 1 block

Standards Addressed

Priority:

- K3.a Develop, analyze and classify fingerprints

Supporting:

- ISTE-EMPOWERED LEARNER.1: Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.
- ISTE - COMPUTATIONAL THINKER.5: Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

Detailed Description/Instructions: Students will develop proper techniques to dust for fingerprints. This can include white or black fingerprinting powder depending on the surface. For example, students can try to dust for fingerprint on a white piece of paper or on a dark lab bench. If time and materials allow, students can attempt to lift the fingerprints using tape. Finally, based on the dusted fingerprint, students can try to classify the type of fingerprint as well as identify different types of minutiae.

Bloom's Levels: Analyze

Webb's DOK: 3

Engaging Scenario

Engaging Scenario (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.) Students will engage in a scenario by either actively printing "suspects" (4-5 people both hands, full print card) and analyzing those prints to match a print lifted from a mock crime scene. Do not tell the students from which hand or which finger the crime scene print was lifted. Or, students will read through a scenario and analyze prepared evidence in order to match suspect prints with those found at a crime scene.

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
Fingerprint Classification	Characterization of Student Fingerprints	In this activity, students will learn how to make proper fingerprints as well as classify their own prints as either arches, loops, or whorls. When good fingerprints have been made, students can try to identify different types of minutiae on their print. This can be done on paper with magnifying glasses, or they can be made on balloons and then blown up to reveal the detail.	30 min (Modified 1 block)
Developing Fingerprints	Dusting for Fingerprints	Students will develop proper techniques to dust for fingerprints. This can include white or black fingerprinting powder depending on the surface. For example, students can try to dust for fingerprint on a white piece of paper or on a dark lab bench. If time and materials allow, students can attempt to lift the fingerprints using tape. Finally, based on the dusted fingerprint, students can try to classify the type of fingerprint as well as identify different types of minutiae.	1 block

Unit 4: Toxicology

Subject: Forensic Science
Grade: 10-12
Name of Unit: Toxicology
Length of Unit: 1.5 weeks
Overview of Unit: In this unit, students will understand the system in which drugs are classified as well as what properties influence the legality of different substances. Additionally, students will learn about toxicity, how it is measured, and the calculations required to determine lethal dose.

Priority Standards for unit:
- K6.a Perform tests to identify various drugs and/or poisons
- K6.b Research and examine how various drugs & poisons affect/move through the human body

Supporting Standards for unit:
- ISTE - KNOWLEDGE COLLECTOR.3: Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
- ISTE - CREATIVE COMMUNICATOR.6: Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.

Unwrapped Concepts (Students need to know)	Unwrapped Skills (Students need to be able to do)	Bloom's Taxonomy Levels	Webb's DOK
various drugs and/or poisons	Identify	Understand	2
how various drugs & poisons affect/move through the human body	Research	Remember	2
how various drugs & poisons affect/move through the human body	Examine	Analyze	2

Essential Questions:
1. How are drugs classified?
2. What is toxicity, and how is it measured?

Enduring Understanding/Big Ideas:
1. Drugs are placed into categories: Narcotics, Hallucinogens, Depressants, Stimulants, Club Drugs, and Steroids. Drugs are also categorized into schedules by the controlled substances act.
2. Toxicity is the degree to which a substance can damage an organism, and is measured by LD50, which is the lethal dose (mg/Kg).

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
Dependence Alcohol Drug	Schedule Toxicity Depressant Hallucinogen Narcotic Stimulant Blood Alcohol Content Ethanol LD50 Toxicology Confirmatory test Presumptive test Steroid

Topic 1: Classification of Drugs

Engaging Experience 1
Title: Drug classification foldable
Suggested Length of Time: 30-45 minutes (Modified 1 block)
Standards Addressed
    Priority:
- K6.b Research and examine how various drugs & poisons affect/move through the human body

Detailed Description/Instructions: Create a 6 flap foldable with the 6 classifications of Drugs on the front flap: Narcotics, Hallucinogens, Depressants, Stimulants, Club Drugs, and Steroids. On the inside, students need to list symptoms and examples of each. Add color pictures of their examples.
Bloom's Levels: Analyze
Webb's DOK: 3

Topic 2: Toxicity

Engaging Experience 1
Title: Toxicity and Lethal Dose Worksheet
Suggested Length of Time: 30 minutes
Standards Addressed
  Priority:
  - K6.a Perform tests to identify various drugs and/or poisons
  - K6.b Research and examine how various drugs & poisons affect/move through the human body

Detailed Description/Instructions: In this activity, students will attempt to solve a variety of problems when presented with toxicity information such as LD50. For example, students can be asked to rank different substances based on their toxicity which would require an understanding of how toxicity and lethal dose are related. Another question that students could be asked is to do a dimensional analysis problem, or several dimensional analysis problems, where students must take the known lethal dose and convert that generally from mg of drug per kg of body mass into something that is more understandable like tablets of drug per pound or amount per body. For example, how many 500 mg tablets of Tylenol with an LD50 of 2404 mg/kg would be lethal for a 175 lb adult?
Bloom's Levels: Analyze
Webb's DOK: 3

Engaging Scenario

Engaging Scenario (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

Each student will research a different poison and a case involving that poison. You will choose a case you consider most interesting or unusual.

Design a slide show presentation containing the following information.

1. Type of Poison;
2. "Chemistry" of the Poison: Element or Compound? Formula or Symbol?
3. Poison's Other Uses
4. Poison's Other Names
5. Effects on Body and/or Symptoms: How is it taken in? What does this chemical do to the body (target organ)? What is the level of toxicity (how much does it take)?
6. Detection: How does science trace the chemical? How do you get a diagnosis of this poison?
7. Lasting effects? Antidotes?
8. Possible treatments?
9. Case Involving Poison: Give the Who? Where? When? What happened? Why? How were they caught? Sentence/Punishment? Include articles or graphics if available Check the scoring guide for more details about this section.

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
Classification of Drugs	Drug Classification Scenario	Create a 6-flap foldable with the 6 classifications of Drugs on the front flap: Narcotics, Hallucinogens, Depressants, Stimulants, Club Drugs, and Steroids. On the inside, students need to list symptoms and examples of each. Add color pictures of their examples.	30-45 minutes (Modified 1 block)
Toxicity	Toxicity and Lethal Dose Worksheet	In this activity, students will attempt to solve a variety of problems when presented with toxicity information such as LD50. For example, students can be asked to rank different substances based on their toxicity which would require an understanding of how toxicity and lethal dose are related. Another question that students could be asked is to do a dimensional analysis problem, or several dimensional analysis problems, where students must take the known lethal dose and convert that generally from mg of drug per kg of body mass into something that is more understandable like tablets of drug per pound or amount per body. For example, how many 500 mg tablets of Tylenol with an LD50 of 2404 mg/kg would be lethal for a 175 lb adult?	30 minutes

Unit 5: Biological Evidence

Subject: Forensic Science
Grade: 10-12
Name of Unit: Biological Evidence
Length of Unit: 2 to 3 weeks
Overview of Unit: Biological evidence will include blood, hair, fiber, and entomology. Within the area of blood, students will learn that blood can be typed for class evidence as well as its DNA analyzed for individual evidence. Additionally, blood spatter will be examined for crime scene reconstruction. Hair and Fiber evidence will be analyzed microscopically to determine species or origin. Finally, the topic of entomology will be introduced as a method of determining post mortem interval.

Priority Standards for unit:
- K3.c Analyze, identify and compare various hair samples.
- K3.d Compare various types of fibers through physical and chemical analysis
- K4.b Accurately type blood.
- K4.c Explore bloodstain patterns as a function of velocity, direction, height and angle of impact

Supporting Standards for unit:
- K11.a Outline insect succession on a body
- K11.b Deduce Time of Death using insect evidence

Unwrapped Concepts (Students need to know)	Unwrapped Skills (Students need to be able to do)	Bloom's Taxonomy Levels	Webb's DOK
various hair samples	Analyze	Analyze	4
various hair sample	Identify	Understand	2
various hair sample	Compare	Analyze	2
various types of fibers through physical and chemical analysis	Compare	Analyze	3
blood	Type	Analyze	3
bloodstain patterns as a function of velocity, direction, height and angle of impact	Explore	Apply	3

Essential Questions:
1. How can blood be used as evidence in a crime scene?
2. How are hair and fiber evidence analyzed?

Enduring Understanding/Big Ideas:
1. Blood can be analyzed for blood type and used as class evidence. There can be DNA analysis of blood to be used as individual evidence. Analysis of the patterns and spatter of blood can lead to reconstruction of the scene, and sequence of events.
2. Hairs and fibers are analyzed microscopically to determine patterns or thread size and count. This will help determine species and origin.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
Blood Type Angle Origin Velocity Transfer Donot Acceptor Natural Manufactured Life cycle	Plasma Erythrocyte Serum Serology Hemoglobin Luminol Area of Convergence Cast-Off Spatter Agglutination Satellite Spatter Void Kastle-Meyer Precipitin Rhesus factor Leukocyte Platelet CODIS Antigen Antibody Medulla Cortex Cuticle Imbricate Coronal Spinous Entomology Larvae Maggot Follicular tag

Topic 1: Hair Evidence

Engaging Experience 1
Title: Microscopic Analysis of Hair
Suggested Length of Time: 1 block (Modified 1-2 blocks)
Standards Addressed
    Priority:
- K3.c Analyze, identify and compare various hair samples.

Detailed Description/Instructions: In this activity, students will be looking at the different features of hair strands using microscopes. Parts that students will be identifying include the medulla, cortex, cuticle, and a follicular tag if possible. As a side note, the activity can be extended to include the hair of a suspect and students should try to match it with a hair found on a victim.

Bloom's Levels: Analyze
Webb's DOK: 4

Topic 2: Fiber Evidence

Engaging Experience 1
Title: Analysis of Fiber Samples
Suggested Length of Time: 1 block
Standards Addressed
   Priority:
   ● K3.d Compare various types of fibers through physical and chemical analysis
Detailed Description/Instructions: In this activity, students will attempt to identify the type of fiber based on the results of different tests such as a burn test, dye test, or stretch test. This activity would also look at the different types of fibers under a microscope and characterize certain features. Additionally, this activity could include a set of fibers from a suspect and victim and students can try to match the fibers based on their characteristics.
Bloom's Levels: Analyze
Webb's DOK: 4

Topic 3: Blood Evidence

Engaging Experience 1
Title: Blood Typing Activity
Suggested Length of Time: 1 block
Standards Addressed
    Priority:
- K4.b Accurately type blood.

Detailed Description/Instructions: Utilizing different samples of simulated blood, students will identify the type of blood based on the reaction or lack of reaction with different antibodies. The same process can be used to determine of the sample of blood does or does not have the rhesus factor. Additionally, the activity could include a component where students attempt to identify the suspect of a crime based on the type of blood present.
Bloom's Levels: Analyze
Webb's DOK: 4

Engaging Experience 2
Title: Bloodstain Pattern Analysis
Suggested Length of Time: 1 block (Modified 2-3 blocks)
Standards Addressed
    Priority:
- K4.c Explore bloodstain patterns as a function of velocity, direction, height and angle of impact

Detailed Description/Instructions: In this activity, students will look at relationships between height of a blood droplet and the diameter of the resulting spatter. The angle at which the drop hits can also be measured. A graph could be produced and can be utilized when identifying the height/angle of a blood droplet from a crime scene.
Bloom's Levels: Analyze
Webb's DOK: 4

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
Hair Evidence	Microscopic Analysis of Hair	In this activity, students will be looking at the different features of hair strands using microscopes. Parts that students will be identifying include the medulla, cortex, cuticle, and a follicular tag if possible. As a side note, the activity can be extended to include the hair of a suspect and students should try to match it with a hair found on a victim.	1 block (Modified 1-2 blocks)
Fiber Evidence	Analysis of Fiber Samples	In this activity, students will attempt to identify the type of fiber based on the results of different tests such as a burn test, dye test, or stretch test. This activity would also look at the different types of fibers under a microscope and characterize certain features. Additionally, this activity could include a set of fibers from a suspect and victim and students can try to match the fibers based on their characteristics.	1 block
Blood Evidence	Blood Typing Activity	Utilizing different samples of simulated blood, students will identify the type of blood based on the reaction or lack of reaction with different antibodies. The same process can be used to determine of the sample of blood does or does not have the rhesus factor. Additionally, the activity could include a component where students attempt to identify the suspect of a crime based on the type of blood present.	1 block
Blood Evidence	Bloodstain Pattern Analysis	In this activity, students will look at relationships between height of a blood droplet and the diameter of the resulting spatter. The angle at which the drop hits can also be measured. A graph could be produced and can be utilized when identifying the height/angle of a blood droplet from a crime scene.	1 block (Modified 2-3 blocks)

Unit 6: Ballistics

Subject: Forensic Science

Grade: 10-12

Name of Unit: Ballistics

Length of Unit: 1 to 1.5 weeks

Overview of Unit: This unit focuses on the classification systems of different types of firearms and explosives. This unit also includes testing methods for gunshot and explosive residue. Students will learn about bullet striations and how these can be used for identification of a firearm as well as how to determine the location a bullet came from.

Priority Standards for unit:
- K8.a Distinguish between types of firearms and ammunition
- K8.b Use bullet trajectory to determine position of shooter

Supporting Standards for unit:
- ISTE-EMPOWERED LEARNER.1: Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.
- ISTE - COMPUTATIONAL THINKER.5: Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

Unwrapped Concepts (Students need to know)	Unwrapped Skills (Students need to be able to do)	Bloom's Taxonomy Levels	Webb's DOK
types of firearms and ammunition	Distinguish between	Analyze	2
bullet trajectory to determine position of shooter	Use	Apply	2

Essential Questions:
1. How can a fired bullet be matched to a firearm?
2. How can the distance and location of a fired bullet be determined?

Enduring Understanding/Big Ideas:
1. By using striations on the bullet or casing, similar to minutiae on a fingerprint, a bullet can be matched to a firearm. The lands and grooves of a barrel leave unique markings on the spent bullet.
2. By using physical characteristics of the bullet hole, determine the distance from which it was fired.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
Bullet Explosive Primary Secondary	Ballistics Gauge Caliber Deflagration Striation Detonation Oxidizing agent Greiss Test Lands Grooves Rifling Bore Breechface Gunshot residue Trajectory IBIS NIBIN Drugfire Screening Test Confirmatory test Taggant

Topic 1: Firearms

Engaging Experience 1
Title: Virtual Bullet Comparison
Suggested Length of Time: 45-60 minutes
Standards Addressed
    Priority:
- K8.a Distinguish between types of firearms and ammunition
- K8.b Use bullet trajectory to determine position of shooter

    Supporting:
- ISTE-EMPOWERED LEARNER.1: Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.
- ISTE - COMPUTATIONAL THINKER.5: Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

Detailed Description/Instructions:
1. Go to website: http://www.firearmsid.com
2. On the left hand side of the page under **Resource area**, click on "**Register**."
3. Follow the instructions. Use your email to retrieve the password. Log in.
4. Click on **"Bullet ID - VCM"**
5. **Read** the information and go through the **Tutorial** to get an idea of how to use the virtual comparison microscope.

Bloom's Levels: Analyze
Webb's DOK: 2

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
Firearms	Virtual Bullet Comparison	1. Go to website: http://www.firearmsid.com 2. On the left hand side of the page under **Resource area**, click on "**Register**." 3. Follow the instructions. Use your email to retrieve the password. Log in. 4. Click on **"Bullet ID - VCM"** 5. **Read** the information and go through the **Tutorial** to get an idea of how to use the virtual comparison microscope.	45-60 min

Unit 7: Documents and Impressions

Subject: Forensic Science
Grade: 10-12
Name of Unit: Documents and Impressions
Length of Unit: 2 weeks
Overview of Unit: Trace evidence in this design include document analysis and impressions. Students will learn the art of handwriting analysis as well as the processes used to analyze ink and printing devices. In the area of impressions, students will determine how to collect evidence left by tool marks or other impressions as well as how to analyze that evidence.

Priority Standards for unit:
- K8.c. Design and conduct scientific investigations to match tool marks in a criminal investigation
- K9.c. Conduct an experiment using paper chromatography to determine the ink used
- K3.b. Identify and compare palm, lip prints, bite-marks, shoe prints.

Unwrapped Concepts (Students need to know)	Unwrapped Skills (Students need to be able to do)	Bloom's Taxonomy Levels	Webb's DOK
scientific investigations to match tool marks in a criminal investigation	Design	Apply	3
scientific investigations to match tool marks in a criminal investigation	conduct	Apply	3
an experiment using paper chromatography to determine the ink used	Conduct	Apply	3
palm, lip prints, bite-marks, shoe prints.	compare	Analyze	3
palm, lip prints, bite-marks, shoe prints.	Identify	Understand	2

Essential Questions:
1. How do forensic scientists analyze questioned documents?
2. How does an impression have both class and individual characteristics?
3. How are impressions collected and preserved?

Enduring Understanding/Big Ideas:

1. Questioned documents can be analyzed using chromatography to compare ink of a possible forgery. Additionally, the handwriting of a questioned document can be compared with a known document by looking at slope, slant, and movement of the writing.
2. Impressions can be left from a variety of objects such as shoes, tools, or tires. Each of which have their own class and individual characteristics. For example, shoe size and brand are class characteristics, but the wear of a shoe and any holes in the sole are individual characteristics.
3. Depending on the impression, tire and shoe impressions can be collected using plaster of paris or dental stone. If a print is left in dust or dirt, the impression can be lifted electrostatically.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
Handwriting Ink Document Analysis Footwear Slant Proportion	Impression Chromatography Odontology Casting Trace Evidence Forgery Graphologist/Graphology

Topic 1: Impressions

Engaging Experience 1
Title: Bite mark and forensic odontology lab
Suggested Length of Time: 1 block
Standards Addressed
　　Priority:
- K3.b. Identify and compare palm, lip prints, bite-marks, shoe prints.

Detailed Description/Instructions: In this activity, students will make their own bite marks using either wax or styrofoam plates. Students will then look for unique characteristics in their bite marks, such as missing or crooked teeth, size of the bite mark, etc. The lab activity can be extended to include a suspect bite mark and/or victim photo and then having students attempt to identify who the bite mark belongs to.
Bloom's Levels: Understand
Webb's DOK: 3

Topic 2: Document Analysis

Engaging Experience 1
Title: Ink Chromatography
Suggested Length of Time: 1 block
Standards Addressed
   Priority:
   - K9.c. Conduct an experiment using paper chromatography to determine the ink used

Detailed Description/Instructions: Students will investigate the process of chromatography by using 5-6 ink pens and completing the process of chromatography. After completing the initial process, students will be given a "suspect note" and have to analyze the ink from the note and determine if one of the pens had written the note. The instructor will have to write notes ahead of time.
Bloom's Levels: Analyze
Webb's DOK: 3

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
Impressions	Bite mark and forensic odontology lab	In this activity, students will make their own bite marks using either wax or styrofoam plates. Students will then look for unique characteristics in their bite marks such as missing or crooked teeth, size of the bite mark, etc. The lab activity can be extended to include a suspect bite mark and/or victim photo and then having students attempt to identify who the bite mark belongs to.	1 block
Document Analysis	Ink Chromatography	Students will investigate the process of chromatography by using 5-6 ink pens and completing the process of chromatography. After completing the initial process, students will be given a "suspect note" and have to analyze the ink from the note and determine if one of the pens had written the note. The instructor will have to write notes ahead of time.	1 block

Culminating Unit: Forensic Science Investigation

Subject: Forensic Science
Grade: 10-12
Name of Unit: Forensic Science Investigation
Length of Unit: 1 to 1.5 weeks
Overview of Unit: This is a culminating activity in which student will use the skills that they have practiced over the term of the course. They will need to complete experiments, analyze data, and use that information to come to a well written conclusion.

Priority Standards for unit:
- K1.b Distinguish individual evidence from class evidence and discuss its relevance in a court of law
- K2.a Differentiate procedures for securing and documenting a crime scene
- K2.b Perform evidence collection, storage and report writing.
- K3.a Develop, analyze and classify fingerprints
- K8.c. Design and conduct scientific investigations to match tool marks in a criminal investigation
- K9.c. Conduct an experiment using paper chromatography to determine the ink used
- K3.b. Identify & compare palm, lip prints, bite-marks, shoe prints.
- K3.c Analyze, identify and compare various hair samples.
- K3.d Compare various types of fibers through physical and chemical analysis
- K4.b Accurately type blood.
- K4.c Explore bloodstain patterns as a function of velocity, direction, height and angle of impact
- K6.a Perform tests to identify various drugs and/or poisons

Supporting Standards for unit:
- ISTE - KNOWLEDGE COLLECTOR.3: Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
- ISTE - GLOBAL COLLABORATOR.7: Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.

Engaging Scenario

Engaging Scenario (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

The instructor will prepare a Final Crime Scene for students to investigate as a team of Forensic Scientists. The final crime scene should include types of evidence from multiple units that will tie together to solve the crime. Students should be required to test the evidence, record their results in a data table, analyze the evidence, and come to a conclusion regarding the case. There are several kits available through Flinn Scientific or other distributors that will provide the scenario and evidence, for example: Anytown Mall, The Crime Scene, Detective's Casebook, and Mr. Mathematics Mysterious Murder. In several of these options, there are 5 suspects which allows the instructor to assign each student a suspect so there can be an individual component to the grade as well as a group grade. A final case report is recommended.

Unit of Study Terminology

Appendices: All Appendices and supporting material can be found in this course's shell course in the District's Learning Management System.

Assessment Leveling Guide: A tool to use when writing assessments in order to maintain the appropriate level of rigor that matches the standard.

Big Ideas/Enduring Understandings: Foundational understandings teachers want students to be able to discover and state in their own words by the end of the unit of study. These are answers to the essential questions.

Engaging Experience: Each topic is broken into a list of engaging experiences for students. These experiences are aligned to priority and supporting standards, thus stating what students should be able to do. An example of an engaging experience is provided in the description, but a teacher has the autonomy to substitute one of their own that aligns to the level of rigor stated in the standards.

Engaging Scenario: This is a culminating activity in which students are given a role, situation, challenge, audience, and a product or performance is specified. Each unit contains an example of an engaging scenario, but a teacher has the ability to substitute with the same intent in mind.

Essential Questions: Engaging, open-ended questions that teachers can use to engage students in the learning.

Priority Standards: What every student should know and be able to do. These were chosen because of their necessity for success in the next course, the state assessment, and life.

Supporting Standards: Additional standards that support the learning within the unit.

Topic: These are the main teaching points for the unit. Units can have anywhere from one topic to many, depending on the depth of the unit.

Unit of Study: Series of learning experiences/related assessments based on designated priority standards and related supporting standards.

Unit Vocabulary: Words students will encounter within the unit that are essential to understanding. Academic Cross-Curricular words (also called Tier 2 words) are those that can be found in multiple content areas, not just this one. Content/Domain Specific vocabulary words are those found specifically within the content.