Wethersfield Public Schools

WHS Curriculum: Forensics

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| **Grade(s)** | 11, 12 |
| **Unit Title and Purpose** | **Unit 1: Introduction: The Background to Forensics** |
| **Timeframe** | 3 weeks |

## Vision of the Graduate

**Communicator:** Students will create a presentation on one of the fields of study within the greater field of forensics science to discuss with the group.

## Unit Priority Standards

**HS-ETS1-1.** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
**LWC09.03.** Analyze the characteristics of different career fields within the Law, Public Safety, Security and Corrections cluster to develop a personal perspective on the nature of the work, entry-level requirements, career paths and challenges.

## Unit Supporting Standards

**LWPE01.02.** Execute verbal and oral communication skills to demonstrate academic preparation for effectively communicating in the legal services environment.
**LWPE01.03.** Analyze and interpret nonverbal communication cues in order to discern facts from fabrication in messages received in the legal services environment.
**CCSS.ELA-LITERACY.RST.11-12.7.** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
**CCSS.ELA-LITERACY.W.11-12.1.A.** Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.
**CCSS.ELA-LITERACY.W.11-12.7.** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
**CCSS.ELA-LITERACY.SL.11-12.1.** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
**CCSS.ELA-LITERACY.SL.11-12.4.** Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

## Essential Questions

How can forensic science make the justice system more impartial?

What might the future of forensic science look like?

How is the depiction of forensic science in popular media misleading?

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| Performance Expectations: Skills | Performance Expectations: Essential Knowledge/Concepts |
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| 1. Present information or findings to peers<br>2. Organize notes in a fashion that allows them to be legible to all and detailed enough to be submitted as evidence<br>3. Read and analyze articles on scientific and legal concepts, and apply evidence from texts to support a position | 1. Define forensic science and its connection to the sciences<br>2. Describe the education needed to be a Forensic Scientist<br>3. Analyze how scientific advancements have contributed to the more effective use of forensic science in solving crimes<br>4. Understand how the Lindbergh kidnapping case affected Forensic Science<br>5. Learn the types and organization of local, state and federal crime labs<br>6. Understand the major legal decisions that affect the admissibility of evidence in court<br>7. Compare and contrast Frye and Daubert decisions relating the admissibility of scientific evidence in the courtroom and explain the role and responsibilities of the expert witness.<br>8. Describe court cases and inspect evidence across multiple fields of forensic science |
| **Student Learning Tasks & Resources** | **Suggested Teacher Materials/Resources** |
| ● Career Mini Presentation: Introduces to students the possible careers within the field of forensics<br>● Hollywood Vs Reality Project: Students analyze the differences between forensics portrayed in media and the actual field of forensics.<br>● Case Study–the Lindbergh kidnapping: Students read their first example case which is famous for starting the FBI and having many aspects within the field of forensics connected to it | ● American Academy of Forensic Sciences<br>● FBI Laboratory Positions<br>● Northeastern Association of Forensic Scientists<br>● CT Forensic Science Laboratory<br>● International Association for Identification<br>● Lindbergh Kidnapping — FBI |

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| **Grade(s)** | 11, 12 |
| **Unit Title and Purpose** | **Unit 2: Crime Scene Investigation Overview** |
| **Timeframe** | 3 weeks |

## Vision of the Graduate

**Collaborator:** Students will work together to understand the validity of different forensic methods while determining how to properly collect and document evidence to be viewed by other people working on the case.

## Unit Priority Standards

**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.
**ESS01.04.02.** Apply scientific methods in qualitative and quantitative analysis, data gathering, direct and indirect observation, predictions, and problem identification.

## Unit Supporting Standards

**HS-ETS1-1.** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
**ESS02.01.02.** Demonstrate use of content, technical concepts and vocabulary when analyzing information and following directions.
**ESS02.01.04.** Interpret information, data, and observations to apply information learned from reading to actual practice.
**ESS02.01.05**. Transcribe information, data, and observations to apply information learned from reading to actual practice.
**ESS02.01.06.** Communicate information, data, and observations to apply information learned from reading to actual practice.
**ESS02.02.02.** Record information needed to present a report on a given topic or problem.
**ESS02.02.03.** Write internal and external business correspondence that conveys and/or obtains information effectively.
**ESS02.02.04.** Communicate with other employees to clarify workplace objectives.
**ESS02.02.05.** Communicate effectively with customers and employees to foster positive relationships.

## Essential Questions

Is there such a thing as a “perfect crime”?

What is the worst way to preserve a crime scene?

What is valid scientific evidence?

What are some reasons why evidence would be “disallowed”?

| Performance Expectations: Skills | Performance Expectations: Essential Knowledge/Concepts |
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| 1. Define the crime scene and identify the steps followed in crime scene investigation (7S's)<br>2. Describe the use and information obtained from physical evidence found at the crime scene<br>3. Describe how to collect, package, and preserve physical evidence at a crime scene<br>4. Summarize and present crime scene reports including sketches, photographs, notes and lab<br>5. Demonstrate proper documentation of the crime scene, various techniques used to effectively search a crime scene, and proper techniques for results analysis | 1. Explain Locard's Exchange principle<br>2. Know when a search warrant is needed<br>3. Know how to document and preserve evidence<br>4. Know how to maintain chain of custody<br>5. Identify class and individual characteristics<br>6. Explain what qualifies a technique for being admissible in court (Frye and Daubert) |
| **Student Learning Tasks & Resources** | **Suggested Teacher Materials/Resources** |
| ● Locard Principle Lab: Students develop an understanding of the exchange phenomenon that happens between two objects<br>● Class and Individual Characteristics Lab: A stations activity challenges students to test if evidence is highly specific to an individual or if the evidence is more broad or common amongst groups<br>● Crime Scene Sketch Lab: Students recreate a crime scene to scale using measurement techniques used by CSI<br>● Making a Druggist Fold video: Students learn a technique used to store fibers and hair | ● FBI Crime Scene manual<br>● Crime Scene Sketch Worksheet |

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| **Grade(s)** | 11, 12 |
| **Unit Title and Purpose** | **Unit 3: Trace Evidence: Handwriting, Fingerprint, and Imprint Analysis** |
| **Timeframe** | 4 weeks |

## Vision of the Graduate

**Problem Solver:** Using forensic comparisons to catalog and create models for different types of physical evidence in order to connect suspects to crime scene evidence.

## Unit Priority Standards

**ESS01.04.01.** Evaluate scientific constructs including conclusions, conflicting data, controls, data, inferences, limitations, questions, sources of errors, and variables.
**ESS01.04.02.** Apply scientific methods in qualitative and quantitative analysis, data gathering, direct and indirect observation, predictions, and problem identification.
**RST.11-12.8.** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

## Unit Supporting Standards

**ESS02.02.02.** Record information needed to present a report on a given topic or problem.
**ESS02.02.03.** Write internal and external business correspondence that conveys and/or obtains information effectively.
**CCSS.ELA-LITERACY.RST.11-12.7.** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
**CCSS.ELA-LITERACY.W.11-12.1.A.** Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.
**CCSS.ELA-LITERACY.SL.11-12.1.** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

## Essential Questions

How important is one fiber (hair) to solving a crime? How would multiple fibers (hairs) help to solve a crime?

Are shoe prints (tire prints) unique?

In what ways are fingerprints unique?

In what ways did your education affect your handwriting?

What is the process of matching a tool with a tool mark?

| Performance Expectations: Skills | Performance Expectations: Essential Knowledge/Concepts |
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| 1. Analyze the common ridge characteristics of a fingerprint<br>2. Identify and compare the three major fingerprint patterns and their respective subclasses<br>3. Distinguish among visible, plastic and latent fingerprints | 1. Know the history of personal identification (Bertillon system, Will West case)<br>2. Know how to obtain and examine fingerprint evidence |

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| 4. Identify and demonstrate the techniques for developing latent fingerprints on porous and nonporous objects<br>5. Distinguish between latent, patent, and plastic impressions<br>6. Photograph and make castes of footprints using dental stone<br>7. Use databases to identify footwear manufacturers<br>8. Use track width and wheelbase information to identify a motor vehicle<br>9. Distinguish between natural and synthetic fibers<br>10. Distinguish between human and animal hair using the medullary index | 3. Describe the concept of an automated fingerprint identification system (AFIS) and its importance to forensic investigation<br>4. Explain how various types of impressions can be used as evidence<br>5. Know the different types of microscopes and their uses<br>6. Identify the parts of a compound microscope<br>7. List the parts of a hair and name its growth stages<br>8. Identify common characteristics associated with handwriting and list important guidelines for collecting exemplars for comparison to a questioned document |
| **Student Learning Tasks & Resources** | **Suggested Teacher Materials/Resources** |
| ● Using a compound microscope: Students practice using terms and using techniques related to a compound microscope<br>● Fiber Identification Lab: Students create a catalog of known fibers and their characteristics<br>● Human and Animal Hair Differentiation Lab: Students create a catalog of known hairs, including human hair, and their characteristics<br>● Medullary Index Lab: Students learn the process of measuring the medulla of a hair sample<br>● Footprint Track Casting Lab: Students are challenged to connect a cast of footprint tracks to a specific shoe<br>● Hot Wheels Tire Identification Lab: Toy cars are used to simulate tire track identification in cases related to vehicles<br>● Tire Track Challenge<br>● Plastic Density Lab: Students simulate the density of glass determinations<br>● Glass Refractive Index Lab: Students use light rays to determine refraction rate of different glass<br>● Bertillon Measurement: Data collection for personal identification (Biometrics)<br>● Fingerprint identification and minichart presentation: Students look into fingerprints and are challenged to connect mystery prints to a suspect<br>● Handwriting Analysis Lab and mini chart: Students look into handwriting and are challenged to | ● Atlanta Child Homicide Case<br>● Madrid Bombing Case<br>● Zodiac Killer<br>● Hitler Diary<br>● CSP Patch of trooper hit by truck |

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| connect a mystery handwriting sample to a suspect | |

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| **Grade(s)** | 11,12 |
| **Unit Title and Purpose** | **Unit 4: Biological Evidence** |
| **Timeframe** | 3 weeks |

## Vision of the Graduate

**Collaborator:** Being able to use DNA and biological evidence as a basis to convince others of the guilt or innocence of a suspect.

## Unit Priority Standards

**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.
**RST.11-12.8.** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

## Unit Supporting Standards

**CCSS.ELA-LITERACY.RST.11-12.7.** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
**CCSS.ELA-LITERACY.RST.11-12.8.** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
**CCSS.ELA-LITERACY.W.11-12.1.A.** Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.
**CCSS.ELA-LITERACY.SL.11-12.1.** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

## Essential Questions

Is DNA evidence the final judge? (Is DNA evidence the most important piece of evidence that could be found?)

How is blood spatter evidence used to recreate a crime scene?

How is it determined that someone died of poisoning?

| Performance Expectations: Skills | Performance Expectations: Essential Knowledge/Concepts |
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| 1. Identify what an investigator can learn from blood spatter analysis.<br>2. Describe the different types of blood spatter patterns.<br>3. Support an argument using evidence to determine if a suspect is innocent or guilty<br>4. Read DNA base pairs to exonerate or incriminate a suspect | 1. A blood spatter pattern at a crime scene can tell the story of a crime. It can tell investigators where the blood originated from, the angle , height, velocity of impact, and the type of weapon used.<br>2. Blood typing is a type of class evidence and can be used to rule out a group of people, however, blood types can not identify a single individual.<br>3. DNA profiling from blood can identify a single suspect.<br>4. Explain what LD50 is and how it is determined |

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| | for different substances and use it to classify how toxic a substance is<br>5. Describe how to determine blood type, given a sample<br>6. Describe how to screen for the presence of human blood using species and presumptive tests<br>7. Describe how the newest DNA typing techniques, like short tandem repeats (STRs) and polymerase chain reaction (PCR) are applied to forensic DNA typing and how CODIS is used to compare DNA samples<br>8. Describe the difference between nuclear and mitochondrial DNA<br>9. List the necessary procedures for proper preservation of biological evidence for laboratory DNA analysis |
| **Student Learning Tasks & Resources** | **Suggested Teacher Materials/Resources** |
| ● Blood Spatter height, angle, area of convergence labs: Students view a sample crime scene and use blood spatter trajectories to re-create events.<br>● Blood Spatter Lab<br>● Recovering the Romanovs Virtual Lab<br>● Matching DNA evidence to suspects activity<br>● Mouse Party Virtual Lab: Learn through a simulation about how different drugs affect the human body.<br>● Make poster on ABO typing, Rh typing, Presumptive tests, Species tests, blood safety and contamination<br>● Ernie's exit activity<br>● Time of death with Rigor Mortis activity<br>● When did she die? activity<br>● Analysis of Skeletal remains activity | ● Video NOVA The Poisoner's Handbook - The Standards for The Rest of The America<br>● Dr Sam Sheppard Case<br>● Blood Spatter Explanation<br>● Time of Death Video<br>● Blood Spatter Slides<br>● Serology Slides<br>● Educational - NobelPrize.org |

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| **Grade(s)** | 11,12 |
| **Unit Title and Purpose** | **Unit 5: Firearms and Ballistics**<br>*Example Case as a Summative Project* |
| **Timeframe** | 3 weeks |

## Vision of the Graduate

**Problem Solver:** Students will match marks made by tools and equipment to their source.
**Communicator:** Students will convey their knowledge of the crime scene investigation process through a physical display of the aspects of the crime including, but not limited to: the crime scene, the evidence, and the way the crime would be solved.

## Unit Priority Standards

**ESS03.01.** Employ critical thinking skills independently and in teams to solve problems and make decisions (e.g., analyze, synthesize and evaluate).
**RST.11-12.8.** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
**RST.11-12.3.** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

## Unit Supporting Standards

**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.
**CCSS.ELA-LITERACY.RST.11-12.7.** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
**CCSS.ELA-LITERACY.RST.11-12.9.** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
**CCSS.ELA-LITERACY.W.11-12.1.A.** Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.
**CCSS.ELA-LITERACY.WHST.11-12.2.B.** Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
**CCSS.ELA-LITERACY.SL.11-12.1.** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
**CCSS.ELA-LITERACY.SL.11-12.1.D.** Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

## Essential Questions

In what ways can finding the trajectory of a bullet influence an investigation?

How would a specific bullet be matched to a suspect gun?

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| Performance Expectations: Skills | Performance Expectations: Essential Knowledge/Concepts |
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| 1. Follow precisely a multi-step process and analyze the results<br>2. Match ballistic evidence with the instrument used to create the mark<br>3. Determine the position of the shooter based on bullet trajectory | 1. Discuss the significance of tool mark impressions in criminal investigations<br>2. Describe major types of tool mark impressions<br>3. Describe variations in tool surface characteristics that are used to identify individual tools<br>4. Describe how tool mark evidence is collected, preserved and documented<br>5. Describe rifling on a gun barrel and explain how it marks a bullet<br>6. Describe how bullets are test fired and matched<br>7. Discuss the role of ballistics recovery and examination at a crime scene |
| **Student Learning Tasks & Resources** | **Suggested Teacher Materials/Resources** |
| ● Flinn Ballistics Lab: Track bullet trajectories to their point of origin<br>● Create a poster illustrating the trajectory of bullets in the Kennedy assassination<br>● Playdough Toolmark identification lab: Students connect tool mark impressions with the correct tool mark<br>● Bullet Casing identification lab: Students match casing evidence to the correct suspect<br>● Crime Scene in a box: Students create a crime scene in box, podcast, television show, diorama, mystery short story | ● Son of Sam Case<br>● Kennedy Assassination<br>● Sacco and Vanzetti<br>● Forensics Crime Scene Project by Danielle Joy<br>● Crime Science Investigation Project<br>● Crime scene box example pictures<br>● Ballistics slides |