

Cedar Grove School District

Cedar Grove, NJ

2017 | Grade 12

Forensics



Approved by the Cedar Grove Board of Education

Superintendent of Schools
Mr. Michael J. Fetherman

Board of Education
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Forensics

Course Description

Forensic Science is the application of science to law. As society continues to grow, its successful management is becoming increasingly dependent upon laws to regulate the activities of its members. Forensic science applies the knowledge and technology of science as a foundation for the development and enforcement of such laws.

In order to provide truthful evaluation of crime scenes and crime scene related evidence, the principles of science must be applied. The most general of the principles to be incorporated is the Scientific Method, a manner by which human beings can logically reason through complex problems. Within the parameters of the Scientific Method, the core subjects of Chemistry, Biology, Physics, and Geology often come into play. Additionally, as details become more involved, the Scientific foci of Forensic Anthropology, Firearms Analysis, Entomology, Fingerprint Analysis, Odontology, Pathology, and Psychology can be crucial.

This course is designed to give students an overview of forensics and the applications of many scientific disciplines which contribute toward the successful and accurate completions of criminal investigations.

**This curriculum was written in accordance with the
NEW JERSEY STUDENT LEARNING STANDARDS
for Science, 21ST Century Life & Careers,
Technology, Social Studies, English Language Arts, and
Mathematics.**

These standards can be viewed at <http://www.state.nj.us/education/cccs/>

Forensics

Unit 1: The Forensic Scientist

Instructional Time: 4 Weeks

Unit Description

As the course begins, students are introduced to Forensics Science and its various participants. They begin to learn about what evidence may be potentially available at a crime scene and the protocols for gathering this evidence along with how it will be analyzed, either at the scene or in the laboratory. It is imperative that a thorough and comprehensive introduction be made so as to prepare the students for the rigor of crime scene investigations to come.

Student Learning Objectives

- Evaluate basic evidence collection protocol and crime scene processing techniques.
- Explore the various roles played by Forensics Professionals and Scientists working together in a Forensics Investigation.
- Apply the Forensics Triangle in the analysis of a multitude of Case Studies. The Forensics Triangle being a symbolic representation of effectively making connections between the crime(s)/crime scene(s) and the suspect(s) and the victim(s) with concrete evidence, preferably as much physical evidence as possible.

New Jersey Student Learning

New Jersey Student Learning Standards for 21st Century Life and Careers:

9.3.LW.1	Analyze the nature and scope of the Law, Public Safety, Corrections & Security Career Cluster and the role law, public safety, corrections and security play in society and the economy.
9.3.LW.5	Analyze the various laws, ordinances, regulations and organizational rules that apply to careers in law, public safety, corrections and security.
9.3.LW.6	Describe various career opportunities and means to those opportunities in each of the Law, Public Safety, Corrections & Security Career Pathways.
9.3.LW-ENF.1	Demonstrate effective communication skills (e.g., writing, speaking, listening and nonverbal communication) required in law enforcement.
9.3.LW-ENF.5	Analyze the impact of federal, state and local laws on law enforcement procedures.
9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.
9.3.LW-LEG.6	Use legal terminology to communicate within the legal services community.
9.3.LW-SEC.1	Demonstrate effective communications skills (e.g., writing, speaking, listening and nonverbal communication) when communicating security-related directives, technical concepts and other information.

New Jersey Student Learning Standards for Technology

8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
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New Jersey Student Learning Standards for English Language Arts

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.
WHST.9-12.1	Write arguments focused on discipline-specific content.
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.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.
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.	
New Jersey Student Learning Standards for Mathematics		
MP.2	Mathematic Modelling: Reason abstractly and quantitatively	
MP.4	Mathematic Modelling: Model with mathematics.	
Enduring Understandings		Essential Questions
<ul style="list-style-type: none"> The role of the Scientific Method in Forensic Scientists' endeavors, inclusive of addressing the crime scene, gathering evidence, analyzing evidence and drawing conclusions is critical. The Forensics Triangle can help guide the Crime Scene Analyst in using the Scientific Method to effectively make connections between the crime(s)/crime scene(s) and the suspect(s) and the victim(s). The understanding of the Scientific Method builds the foundation for forensic career exploration. 		<ul style="list-style-type: none"> What are the expectations of the Detective, Crime Scene Investigator/Analyst, and various Forensic Scientists in criminal investigations? What is the chain of custody and its significance? How is a typical forensic crime laboratory arranged? What are the key tools, instruments, and pieces of equipment?
Concepts		Formative Assessment
<ul style="list-style-type: none"> Scientific Method Forensics Triangle Locard's Exchange Principle Various scientific disciplines which make up Forensic Science Crime Scene Protocol Analysis of Evidence Class Characteristics Individual Characteristics 		<ul style="list-style-type: none"> Case Study Question Sheets and Forensic Triangle Completion Laboratory Activities Crime Scene Simulations Terminology Review Puzzles
Suggested Learning Activities		
<ul style="list-style-type: none"> Video Lesson Case Studies: <ul style="list-style-type: none"> Lessons depict the roles of the Investigating Detectives and Crime Scene Investigators. Lesson depicts the role of the contributing Forensic Scientists. Introductory Fingerprinting: Laboratory exercise involving fingerprint identification as both a class characteristic and an individual characteristic. Crime Scene Simulation: Students exercise crime scene sketching (to scale) and other basic activities pertaining to crime scene processing. Forensic Scientists Test: Students will be tested on the roles of the various scientific disciplines in the context of comprehensive criminal investigations. Forensic Career Exploration Writing Endeavor: Students will look at various local, state, and federal agencies in the US which employ professionals in the fields of the Forensic Sciences, discuss the agencies role in society along with the professional's role in the agency. 		
Performance Expectations		
Science and Engineering Practices	DCI	Crosscutting Concepts
<ul style="list-style-type: none"> Asking questions Planning and carrying out investigations Analyzing and Interpreting data Using Mathematics and computational thinking Constructing explanations Engaging in argument from evidence Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> Physical Sciences: HS – PS2-1, 2, 3 Life Sciences: HS-LS1-1, 2 Engineering, Technology, and Applications of Science: HS-ETS1-3-4 Chemistry: HS-PS1-2 	<ul style="list-style-type: none"> Patterns Cause and Effect: Mechanism and Explanation Scale, Proportion, and Quantity
21st Century Career Ready Practices		

- CRP1.** Act as a responsible and contributing citizen and employee.
- CRP2.** Apply appropriate academic and technical skills.
- CRP3.** Attend to personal health and financial well-being.
- CRP4.** Communicate clearly and effectively and with reason.
- CRP5.** Consider the environmental, social and economic impacts of decisions.
- CRP6.** Demonstrate creativity and innovation.
- CRP7.** Employ valid and reliable research strategies.
- CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP9.** Model integrity, ethical leadership and effective management.
- CRP10.** Plan education and career paths aligned to personal goals.
- CRP11.** Use technology to enhance productivity.
- CRP12.** Work productively in teams while using cultural global competence.

Suggested Resources

Textbooks:

- *Criminalistics, An Introduction to Forensic Science*, Richard Saferstein
- *Practical Crime Scene Analysis and Reconstruction*, Ross M. Gardner and Tom Bevel

Reference Websites:

- CSI Web Adventures: <http://forensics.rice.edu/>
- The Science Spot: <http://sciencespot.net/Pages/classforsci.html>
- Forensics Files Episodes: <https://www.youtube.com/>
- Reddy's Forensics Page: <http://www.forensicpage.com/new09.htm>
- Stephen Gallagher's Forensics Science at Harry S. Truman's High School: <https://sites.google.com/site/crimesceneanalysis/home>

Forensics

Unit 2 – Forensics Chemistry and the Forensics Laboratory

Instructional Time: 4 Weeks

Description

An understanding of the typical Forensics Crime Lab is essential for the Forensics Science Student. As they begin to develop awareness of the types of evidence encountered at crime scenes, familiarity with the laboratory analytical processes involved in analyzing them becomes crucial. Also, exposure to the role of the various types of Forensic Scientists working in the Forensics Laboratory is relevant as the students begin to consider college preparation and career exploration. Additionally, focus will be directed toward the Forensic Chemist so as to help students better understand their analyses roles in criminal investigations, particularly through use of the Gas Chromatograph/Mass Spectrometer (GC/MS), an analytical tool which can determine the chemical composition of unknown substances, so often finding application in criminal investigations.

Student Learning Objectives

- Explore the various evidence analysis techniques available from the Forensics Crime Laboratory with additional focus on the Forensic Chemist and their use of the GC/MS.
- Explain and elaborate upon the roles of the different Forensic Scientists in the Forensic Laboratory.
- Differentiate between Class and Individual Characteristics with regard to Physical Evidence.

New Jersey Student Learning Standards

New Jersey Student Learning Standards for Science/NGSS

HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS-PS1-6	Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

New Jersey Student Learning Standards for 21st Century Life and Careers

9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.
9.3.LW-LEG.6	Use legal terminology to communicate within the legal services community.

New Jersey Student Learning Standards for Technology

8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
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New Jersey Student Learning Standards for English Language Arts

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.
WHST.9-12.1	Write arguments focused on discipline-specific content.
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.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.
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.

New Jersey Student Learning Standards for Mathematics

MP.2	Mathematic Modelling: Reason abstractly and quantitatively
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MP.4	Mathematic Modelling: Model with mathematics.	
Enduring Understandings		Essential Questions
<ul style="list-style-type: none"> The full service crime lab, such as the one run by the FBI, provides expertise in various fields: Biology, Firearms, Photography, Toxicology, Document Examination, Polygraphs (Lie Detection), Fingerprinting, Voice Analysis, and Evidence Collection. The GC/MS is an important analytical tool used by the Forensic Chemist to identify unknown substances. Cooperation and communication between Forensics Labs on the local, state, and federal level is critical. 		<ul style="list-style-type: none"> What critical protocols and interactions exist between those responsible for evidence collection (Evidence Collection Unit) and those responsible for evidence analysis in the laboratory? How are experts in different areas of Forensic Science responsible for evidence analysis pertaining to their area of expertise? In what ways does the Forensic Scientist analyze physical evidence in terms of Class and Individual Characteristics? What analyses can be performed by the Forensic Chemist through use of the Gas Chromatograph/Mass Spectrometer (GC/MS)?
Concepts		Formative Assessment
<ul style="list-style-type: none"> Structure of typical Forensics Crime Lab. Various areas of expertise of scientists in Forensics Crime Lab. Relationship between evidence collection and evidence analysis. With regard to Physical Evidence, Class and Individual Characteristics. Gas Chromatograph/Mass Spectrometer (GC/MS). 		<ul style="list-style-type: none"> Case Study Question Sheets and Forensic Triangle Completion Laboratory Activities Crime Scene Simulations Terminology Review Puzzles
Suggested Learning Activities		
<ul style="list-style-type: none"> Video Lesson Case Studies: Lesson depicts the role of the Investigating Detective and Crime Scene Investigators. Video Lessons Case Studies: Lesson depicts the role of the contributing Forensic Scientists. Crime Scene Simulation: Students exercise crime scene sketching (to scale) along with other basic activities pertaining to crime scene processing and relating evidence to the specific Forensic Discipline involved with analyzing that evidence. Forensics Chemistry Lab: Students apply their knowledge of density to distinguish between and identify unknown metals related to a firearms analysis investigation. Crime Lab Test: Students will be tested on their newly acquired knowledge pertaining to the typical Forensics Laboratory. Forensic Scientists Test: Students will be tested on the roles of the various scientific disciplines in the context of comprehensive criminal investigations. 		
Performance Expectations		
Science and Engineering Practices	DCI	Crosscutting Concepts
<ul style="list-style-type: none"> Asking questions Planning and carrying out investigations Analyzing and Interpreting data Using Mathematics and computational thinking Constructing explanations Engaging in argument from evidence Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> Physical Sciences: HS – PS2-1, 2-3 Life Sciences: HS-LS1-1, 2 Engineering, Technology, and Applications of Science: HS-ETS1-3, 4 Chemistry: HS-PS1-2 	<ul style="list-style-type: none"> Patterns Cause and Effect: Mechanism and Explanation Scale, Proportion, and Quantity
21st Century Career Ready Practices		
<p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p>		

- CRP3.** Attend to personal health and financial well-being.
- CRP4.** Communicate clearly and effectively and with reason.
- CRP5.** Consider the environmental, social and economic impacts of decisions.
- CRP6.** Demonstrate creativity and innovation.
- CRP7.** Employ valid and reliable research strategies.
- CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP9.** Model integrity, ethical leadership and effective management.
- CRP10.** Plan education and career paths aligned to personal goals.
- CRP11.** Use technology to enhance productivity.
- CRP12.** Work productively in teams while using cultural global competence.

Suggested Resources

Textbooks:

- *Criminalistics, An Introduction to Forensic Science*, Richard Saferstein
- *Practical Crime Scene Analysis and Reconstruction*, Ross M. Gardner and Tom Bevel

Reference Websites:

- CSI Web Adventures: <http://forensics.rice.edu/>
- The Science Spot: <http://sciencespot.net/Pages/classforsci.html>
- Forensics Files Episodes: <https://www.youtube.com/>
- Reddy's Forensics Page: <http://www.forensicpage.com/new09.htm>
- Stephen Gallagher's Forensics Science at Harry S. Truman's High School: <https://sites.google.com/site/crimesceneanalysis/home>

Forensics	
Unit Plan 3 - Fingerprinting	Instructional Time: 2-3 Weeks
Description	
Recovering and analyzing fingerprints is both valuable and critical in many crime scene investigations. Understanding the class and individual characteristics afforded by fingerprints enables the Investigator to make relevant connections to individual persons of interest. In the Investigators' efforts to complete the Forensics triangle, fingerprints are often key pieces of physical evidence which have a significant impact on case closure.	
Student Learning Objectives	
<ul style="list-style-type: none"> • Explain what a fingerprint is and what makes it unique to a specific individual. • With regard to fingerprints, evaluate class and individual characteristics. • Engage in fingerprint comparisons based on class and individual characteristics. 	
New Jersey Student Learning Standards	
New Jersey Student Learning Standards for 21st Century Life and Careers	
9.3.LW-ENF.5	Analyze the impact of federal, state and local laws on law enforcement procedures.
9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.
9.3.LW-ENF.13	Demonstrate procedures to assist individuals requiring special assistance from law enforcement personnel.
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.
9.3.LW-LEG.6	Use legal terminology to communicate within the legal services community.
New Jersey Student Learning Standards for Technology	
8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
New Jersey Student Learning Standards for English Language Arts	
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.
WHST.9-12.1	Write arguments focused on discipline-specific content.
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.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.
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
New Jersey Student Learning Standards for Mathematics	
MP.2	Mathematic Modelling: Reason abstractly and quantitatively
MP.4	Mathematic Modelling: Model with mathematics.
Enduring Understandings	
<ul style="list-style-type: none"> • Obtaining and classifying fingerprints is often a critical part of criminal investigations and completion of the Forensics Triangle. • It is important to be able to differentiate between fingerprints based on class and individual characteristics. 	
Essential Questions	
<ul style="list-style-type: none"> • What is a fingerprint and how is it unique to a specific individual? • What is the basic class categorization of fingerprints? • How does the Crime Scene Investigator go about looking for and collecting fingerprint evidence from 	

<ul style="list-style-type: none"> Based on the nature of the crime being investigated, it is important to have knowledge of where the Forensic Scientist should be looking for fingerprints. 	<ul style="list-style-type: none"> a crime scene? What types of fingerprints can be found at a crime scene? How are databases a valuable tool in the management of fingerprint data? 	
Concepts	Formative Assessment	
<ul style="list-style-type: none"> Scientific Method Forensics Triangle Crime Scene Protocol Analysis of Evidence Fingerprint Collection Fingerprint Analysis 	<ul style="list-style-type: none"> Case Study Question Sheets and Forensic Triangle Completion Laboratory Activities Crime Scene Simulations Fingerprint Collection and Analyses Activities Terminology Review Puzzles 	
Suggested Learning Activities		
<ul style="list-style-type: none"> Video Lesson Case Studies: <ul style="list-style-type: none"> Lesson depicts the roles of the Investigating Detective and Crime Scene Investigators. Lesson depicts the role of the contributing Forensic Scientists specific to the unit being explored. Instructional Videos: Fingerprint collection and analysis techniques. Advanced Fingerprinting: Laboratory exercise involving fingerprint identification in terms of both a class characteristic and an individual characteristic. Crime Scene Simulation: Students exercise crime scene sketching (to scale) and other basic activities pertaining to crime scene processing inclusive of fingerprint collection and analysis. Dactyloscopy Test: Students will be tested on Fingerprinting basics. Activities: Fingerprint matching and terminology review puzzles. 		
Performance Expectations		
Science and Engineering Practices	DCI	Crosscutting Concepts
<ul style="list-style-type: none"> Asking questions Planning and carrying out investigations Analyzing and Interpreting data Using Mathematics and computational thinking Constructing explanations Engaging in argument from evidence Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> Physical Sciences: HS – PS2-1, 2, 3 Life Sciences: HS-LS1-1, 2 Engineering, Technology, and Applications of Science: HS-ETS1-3-4 Chemistry: HS-PS1-2 	<ul style="list-style-type: none"> Patterns Cause and Effect: Mechanism and Explanation Scale, Proportion, and Quantity
21st Century Career Ready Practices		
<p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p> <p>CRP3. Attend to personal health and financial well-being.</p> <p>CRP4. Communicate clearly and effectively and with reason.</p> <p>CRP5. Consider the environmental, social and economic impacts of decisions.</p> <p>CRP6. Demonstrate creativity and innovation.</p> <p>CRP7. Employ valid and reliable research strategies.</p> <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>CRP9. Model integrity, ethical leadership and effective management.</p> <p>CRP10. Plan education and career paths aligned to personal goals.</p> <p>CRP11. Use technology to enhance productivity.</p> <p>CRP12. Work productively in teams while using cultural global competence.</p>		
Suggested Resources		

Textbooks:

- *Criminalistics, An Introduction to Forensic Science*, Richard Saferstein
- *Practical Crime Scene Analysis and Reconstruction*, Ross M. Gardner and Tom Bevel

Reference Websites:

- CSI Web Adventures: <http://forensics.rice.edu/>
- The Science Spot: <http://sciencespot.net/Pages/classforsci.html>
- Forensics Files Episodes: <https://www.youtube.com/>
- Reddy's Forensics Page: <http://www.forensicpage.com/new09.htm>
- Stephen Gallagher's Forensics Science at Harry S. Truman's High School: <https://sites.google.com/site/crimesceneanalysis/home>
- FBI: <https://www.fbi.gov/services/laboratory>

Forensics	
Unit Plan 4 - Forensics Biology: Serology and DNA	Instructional Time: 3-4 Weeks
Unit Description	
The Biological aspects of Forensic Science: Serology and DNA Profiling; are invaluable resources to the CSI. According to Locard's Exchange Principle, every contact between individuals leaves behind some evidence of that contact. Forensics investigations often result from violent interactions between individuals, therefore evidence of this contact between individuals often consists of Biological materials such as blood. Biological materials provide valuable evidence to the Forensic Scientist, particularly with the applications of DNA based technologies	
Student Learning Objectives	
<ul style="list-style-type: none"> Assess and evaluate blood types: A, B, AB, and O along with the associated Rh factors; and understand how blood evidence can be utilized in the Forensics Investigation. Elaborate upon the value of DNA evidence to the CSI along with sources of DNA evidence, the processing of DNA evidence, and DNA profiling. Explore the historical progression of DNA profiling and its impact on the CSI community. 	
New Jersey Student Learning Standards	
New Jersey Student Learning Standards for Science/NGSS	
HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
HS-PS3-5	Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.
New Jersey Student Learning Standards for 21st Century Life and Careers	
9.3.LW-ENF.5	Analyze the impact of federal, state and local laws on law enforcement procedures.
9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.
9.3.LW-ENF.13	Demonstrate procedures to assist individuals requiring special assistance from law enforcement personnel.
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.
9.3.LW-LEG.6	Use legal terminology to communicate within the legal services community.
New Jersey Student Learning Standards for Technology	
8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
8.1.12.E.1	Produce a position statement about a real world problem by developing a systematic plan of investigation with peers and experts synthesizing information from multiple sources.
New Jersey Student Learning Standards for English Language Arts	
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
New Jersey Student Learning Standards for Mathematics	
MP.2	Mathematic Modelling: Reason abstractly and quantitatively
MP.4	Mathematic Modelling: Model with mathematics.
Enduring Understandings	
Essential Questions	

<ul style="list-style-type: none"> • Awareness of means of locating and identifying Biological fluids at the crime scene is crucial in the CSI's efforts to complete the Forensics Triangle. • An understanding of the potential value of Biological evidence in terms of class characteristics and individual characteristics is important. • Along with Fingerprints, DNA profiles are another valuable source of evidence that can be linked to a specific individual. 	<ul style="list-style-type: none"> • How does the concept of Locard's Exchange Principle apply to Forensic Biology? • In what ways do the concepts of class and individual characteristics apply to Forensic Biology? • What has been the significance of DNA profiling on CSI? • What is an autoradiograph? 	
Concepts	Formative Assessment	
<ul style="list-style-type: none"> • Scientific Method • Forensics Triangle • Locard's Exchange Principle • Crime Scene Protocol • Analysis of Evidence • Blood types • DNA 	<ul style="list-style-type: none"> • Case Study Question Sheets and Forensic Triangle Completion • Laboratory Activities • Crime Scene Simulations • Virtual DNA Profiling • Terminology Review Puzzles 	
Suggested Learning Activities		
<ul style="list-style-type: none"> • Video Lessons Case Studies: Lesson depicts the role of the Forensic Biologist and various other contributing Forensic Scientists. • Forensic Biology Blood Typing Laboratory Activity • Crime Scene Simulation: Students exercise crime blood typing and DNA profiling through virtual simulations. • Forensic Biology Test: Students will be tested on their newly acquired knowledge pertaining to the role of the Forensic Biologist. • Forensic Career Exploration Writing Endeavor: Students will look at various local, state, and federal agencies in the U.S. which employ professionals in the fields of the Forensic Sciences, discuss the agencies role in society along with the professional's role in the agency. 		
Performance Expectations		
Science and Engineering Practices	DCI	Crosscutting Concepts
<ul style="list-style-type: none"> • Asking questions • Planning and carrying out investigations • Analyzing and Interpreting data • Using Mathematics and computational thinking • Constructing explanations • Engaging in argument from evidence • Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> • Physical Sciences: HS – PS2-1, 2, 3 • Life Sciences: HS-LS1-1, 2 • Engineering, Technology, and Applications of Science: HS-ETS1-3, 4 • Chemistry: HS-PS1-2 	<ul style="list-style-type: none"> • Patterns • Cause and Effect: Mechanism and Explanation • Scale, Proportion, and Quantity
21st Century Career Ready Practices		
<p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p> <p>CRP3. Attend to personal health and financial well-being.</p> <p>CRP4. Communicate clearly and effectively and with reason.</p> <p>CRP5. Consider the environmental, social and economic impacts of decisions.</p> <p>CRP6. Demonstrate creativity and innovation.</p> <p>CRP7. Employ valid and reliable research strategies.</p> <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>CRP9. Model integrity, ethical leadership and effective management.</p> <p>CRP10. Plan education and career paths aligned to personal goals.</p> <p>CRP11. Use technology to enhance productivity.</p> <p>CRP12. Work productively in teams while using cultural global competence.</p>		

Suggested Resources

Textbooks:

- *Criminalistics, An Introduction to Forensic Science*, Richard Saferstein
- *Practical Crime Scene Analysis and Reconstruction*, Ross M. Gardner and Tom Bevel

Reference Websites:

- CSI Web Adventures: <http://forensics.rice.edu/>
- The Science Spot: <http://sciencespot.net/Pages/classforsci.html>
- Forensics Files Episodes: <https://www.youtube.com/>
- Reddy's Forensics Page: <http://www.forensicpage.com/new09.htm>
- Stephen Gallagher's Forensics Science at Harry S. Truman's High School: <https://sites.google.com/site/crimesceneanalysis/home>
- Virtual DNA: <http://learn.genetics.utah.edu/content/labs/extraction/>
- Virtual DNA: <http://www.pbs.org/wgbh/nova/education/body/create-dna-fingerprint.html>

Forensics	
Unit Plan 5 – Firearms Analysis	Instructional Time: 3 Weeks
Unit Description	
Firearms analysis plays an integral role in many crime scene investigations due to the unfortunate reason that so much violent crime today involves the use of firearms. Having a basic understanding of Interior, Exterior, and Terminal Ballistics as it relates to the Forensic Sciences is often crucial for the CSI in their efforts to complete the Forensics Triangle. It is expected that at least three weeks will be spent on this Unit.	
Student Learning Objectives	
<ul style="list-style-type: none"> • Explore and explain the basic function and characteristics of firearms and ammunition along with the class characteristic evidence and individual characteristic physical and trace evidence they may provide to the Forensic Investigator. • Explain how a bullet can be matched to the firearm that discharged it. • Explain how a shell casing can be matched to the firearm that produced it. 	
New Jersey Student Learning Standards	
New Jersey Student Learning Standards for Science/NGSS	
HS-PS2-1	Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
HS-PS2-3	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
HS-PS1-3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
New Jersey Student Learning Standards for 21st Century Life and Careers	
9.3.LW-ENF.5	Analyze the impact of federal, state and local laws on law enforcement procedures.
9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.
9.3.LW-ENF.13	Demonstrate procedures to assist individuals requiring special assistance from law enforcement personnel.
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.
9.3.LW-LEG.6	Use legal terminology to communicate within the legal services community.
New Jersey Student Learning Standards for Technology	
8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
New Jersey Student Learning Standards for English Language Arts	
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.
WHST.9-12.1	Write arguments focused on discipline-specific content.
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.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.
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
New Jersey Student Learning Standards for Mathematics	
MP.2	Mathematic Modelling: Reason abstractly and quantitatively
MP.4	Mathematic Modelling: Model with mathematics.

Enduring Understandings		Essential Questions	
<ul style="list-style-type: none"> In crimes where firearms are utilized, there are certain things that the Forensic Investigator has to be aware of as to how connections can be made between the firearm user, the firearm, the victim that it harmed, and the crime scene. 		<ul style="list-style-type: none"> How do firearms function? What are the components of firearm ammunition? How does a Forensic Investigator connect a firearm to its user and to the crime it was used in? In what ways are computer databases proving valuable tools in firearms Analysis? 	
Concepts		Formative Assessment	
<ul style="list-style-type: none"> Scientific Method Forensics Triangle Crime Scene Protocol Analysis of Evidence Firearms Firearms Ammunition Interior, Exterior, and Terminal Ballistics 		<ul style="list-style-type: none"> Case Study Question Sheets and Forensic Triangle Completion Laboratory Activities Crime Scene Simulations Terminology Review Puzzles 	
Suggested Learning Activities			
<ul style="list-style-type: none"> Video Lesson Case Studies: <ul style="list-style-type: none"> Lesson depicts the roles of the Investigating Detective and Crime Scene Investigators Lesson depicts the role of the Medical Examiner and various other contributing Forensic Scientists specific to the unit being explored Crime Scene Simulation: Students exercise various aspects of Firearms Analysis in virtual crime scene investigations. Firearms Analysis Laboratory Activity: Students examine different caliber ammunition and differentiate between cartridges, bullets, and shell casings. They learn about the process of matching a recovered bullet to the firearm that fired it, i.e., ballistic fingerprinting. Firearms Analysis Test: Students will be tested on their knowledge of Firearms Analysis materials. Forensic Career Exploration Writing Endeavor: Students will look at various local, state, and federal agencies in the US which employ professionals in the fields of the Forensic Sciences, discuss the agencies role in society along with the professional's role in the agency 			
Performance Expectations			
Science and Engineering Practices	DCI	Crosscutting Concepts	
<ul style="list-style-type: none"> Asking questions Planning and carrying out investigations Analyzing and Interpreting data Using Mathematics and computational thinking Constructing explanations Engaging in argument from evidence Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> Physical Sciences: HS – PS2-1,2,3 Life Sciences: HS-LS1-1, 2 Engineering, Technology, and Applications of Science: HS-ETS1-3, 4 Chemistry: HS-PS1-2 	<ul style="list-style-type: none"> Patterns Cause and Effect: Mechanism and Explanation Scale, Proportion, and Quantity 	
21 st Century Career Ready Practices			
<p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p> <p>CRP3. Attend to personal health and financial well-being.</p> <p>CRP4. Communicate clearly and effectively and with reason.</p> <p>CRP5. Consider the environmental, social and economic impacts of decisions.</p> <p>CRP6. Demonstrate creativity and innovation.</p> <p>CRP7. Employ valid and reliable research strategies.</p> <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>CRP9. Model integrity, ethical leadership and effective management.</p> <p>CRP10. Plan education and career paths aligned to personal goals.</p> <p>CRP11. Use technology to enhance productivity.</p>			

CRP12. Work productively in teams while using cultural global competence.

Suggested Resources

Textbooks:

- *Criminalistics, An Introduction to Forensic Science*, Richard Saferstein
- *Practical Crime Scene Analysis and Reconstruction*, Ross M. Gardner and Tom Bevel

Reference Websites:

- CSI Web Adventures: <http://forensics.rice.edu/>
- The Science Spot: <http://sciencespot.net/Pages/classforsci.html>
- Forensics Files Episodes: <https://www.youtube.com/>
- Reddy's Forensics Page: <http://www.forensicpage.com/new09.htm>
- Stephen Gallagher's Forensics Science at Harry S. Truman's High School: <https://sites.google.com/site/crimesceneanalysis/home>
- Virtual DNA: <http://learn.genetics.utah.edu/content/labs/extraction/>
- Virtual DNA: <http://www.pbs.org/wgbh/nova/education/body/create-dna-fingerprint.html>
- FBI: <https://www.fbi.gov/services/laboratory>
- ATF: <https://www.atf.gov/>

Forensics

Unit Plan 6 – Impressions

Instructional Time: 3-4 Weeks

Description

Impression evidence includes any markings produced when one object comes into contact with another, leaving behind some kind of indentation or print. Such evidence encountered includes footwear impressions, tire marks, and markings created by tools and similar instruments. According to Locard’s Exchange Principle, every contact leaves a trace. Therefore, impression evidence often weighs heavily in the completion of the Forensics Triangle.

Student Learning Objectives

- Explore the nature of Impressions evidence, how it can be produced during criminal activity, and how it can be analyzed so as to prove fruitful in the investigation.
- Evaluate and elaborate upon different forms of Impressions evidence in terms of class and individual characteristics.

New Jersey Student Learning Standards

New Jersey Student Learning Standards for 21st Century Life and Careers

9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.
9.3.LW-ENF.13	Demonstrate procedures to assist individuals requiring special assistance from law enforcement personnel.
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.

New Jersey Student Learning Standards for Technology

8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
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New Jersey Student Learning Standards for English Language Arts

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.
WHST.9-12.1	Write arguments focused on discipline-specific content.
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.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.
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.

New Jersey Student Learning Standards for Mathematics

MP.2	Mathematic Modelling: Reason abstractly and quantitatively
MP.4	Mathematic Modelling: Model with mathematics.

Enduring Understandings

- Locard’s Exchange Principle that every contact leaves a trace. Very often, evidence of this contact comes in the form of Impression evidence.
- Tools are often used for access at the point of entry and to do bodily harm to the victims of violent crime.
- Shoe impressions are often left behind at crimes scenes as are automobile tire tread impressions, as well.
- Awareness of the value of such evidence often plays

Essential Questions

- What are toolmarks and how can they be classified in terms of class and individual characteristics?
- What are shoe impressions and how can they be classified in terms of class and individual characteristics?
- What are tire tread impressions and how can they be classified in terms of class and individual characteristics?
- How are “accidental characteristics” related to

an integral role in the CSI's efforts to complete the Forensics Triangle.	"individual characteristics" when it comes to toolmark analysis?	
Concepts	Formative Assessment	
<ul style="list-style-type: none"> • Scientific Method • Forensics Triangle • Crime Scene Protocol • Analysis of Evidence • Locard's Exchange Principle • Impression Evidence 	<ul style="list-style-type: none"> • Case Study Question Sheets and Forensic Triangle Completion • Laboratory Activities • Crime Scene Simulations • Terminology Review Puzzles • Toolmark, Shoe, and Tire Impression Evidence Analysis 	
Suggested Learning Activities		
<ul style="list-style-type: none"> • Video Lesson Case Studies: <ul style="list-style-type: none"> ▪ Lesson depicts the roles of the Investigating Detective and Crime Scene Investigators ▪ Lesson depicts the role of the Medical Examiner and various other contributing Forensic Scientists specific to the unit being explored • Crime Scene Simulation: Students exert efforts in analyzing toolmarks, shoe and tire impressions in terms of class and individual characteristics. • Impressions Test: Students will be tested on their knowledge of Impression Evidence. • Forensic Career Exploration Writing Endeavor: Students will look at various local, state, and federal agencies in the US which employ professionals in the fields of the Forensic Sciences, discuss the agencies role in society along with the professional's role in the agency 		
Performance Expectations		
Science and Engineering Practices	DCI	Crosscutting Concepts
<ul style="list-style-type: none"> • Asking questions • Planning and carrying out investigations • Analyzing and Interpreting data • Using Mathematics and computational thinking • Constructing explanations • Engaging in argument from evidence • Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> • Physical Sciences: HS – PS2-1, 2, 3 • Life Sciences: HS-LS1-1, 2 • Engineering, Technology, and Applications of Science: HS-ETS1-3, 4 • Chemistry: HS-PS1-2 	<ul style="list-style-type: none"> • Patterns • Cause and Effect: Mechanism and Explanation • Scale, Proportion, and Quantity
21st Century Career Ready Practices		
<p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p> <p>CRP3. Attend to personal health and financial well-being.</p> <p>CRP4. Communicate clearly and effectively and with reason.</p> <p>CRP5. Consider the environmental, social and economic impacts of decisions.</p> <p>CRP6. Demonstrate creativity and innovation.</p> <p>CRP7. Employ valid and reliable research strategies.</p> <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>CRP9. Model integrity, ethical leadership and effective management.</p> <p>CRP10. Plan education and career paths aligned to personal goals.</p> <p>CRP11. Use technology to enhance productivity.</p> <p>CRP12. Work productively in teams while using cultural global competence.</p>		
Suggested Resources		
<p><i>Textbooks:</i></p> <ul style="list-style-type: none"> • <i>Criminalistics, An Introduction to Forensic Science</i>, Richard Saferstein • <i>Practical Crime Scene Analysis and Reconstruction</i>, Ross M. Gardner and Tom Bevel <p><i>Reference Websites:</i></p> <ul style="list-style-type: none"> • CSI Web Adventures: http://forensics.rice.edu/ 		

- The Science Spot: <http://sciencespot.net/Pages/classforsci.html>
- Forensics Files Episodes: <https://www.youtube.com/>
- Reddy's Forensics Page: <http://www.forensicpage.com/new09.htm>
- Stephen Gallagher's Forensics Science at Harry S. Truman's High School: <https://sites.google.com/site/crimesceneanalysis/home>
- FBI: <https://www.fbi.gov/services/laboratory>
- Forensics Magazine: <http://www.forensicmag.com/>

Forensics

Unit Plan 7 – Forensics Pathology, Toxicology, and Entomology

Instructional Time: 4-6 Weeks

Description

Forensic Pathology is a branch of medicine concerned with determining cause and manner of death through the process of the medical exam. Forensic Toxicology involves the examination of all aspects of toxicity that may have legal implications. A Forensic Toxicology analysis is often considered an integral part of the medical exam in that it can identify foreign substances in the body which may have played a role in the deceased person's death. In some instances, where some significant decomposition has taken place, Forensics Entomologists are often consulted with in the determination of the time of death.

Student Learning Objectives

- Explore the role of the Forensics Pathologist in the investigation of a person's death.
- Elaborate upon the purpose of Forensics Toxicology both in the context of the medical exam and for other investigations regarding toxic substances.
- Engage in the acquisition of insight into how a Forensic Entomologist can use their expertise in insect life cycles to aid in the determination of times of death for corpses which have experienced some level of decomposition and upon which insects have begun to appear.

New Jersey Student Learning Standards

New Jersey Student Learning Standards/NGSS

HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors
HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.

New Jersey Student Learning Standards for 21st Century Life and Careers

9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.
9.3.LW-ENF.13	Demonstrate procedures to assist individuals requiring special assistance from law enforcement personnel.
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.

New Jersey Student Learning Standards for Technology

8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
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New Jersey Student Learning Standards for English Language Arts

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.
WHST.9-12.1	Write arguments focused on discipline-specific content.
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.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.
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas,

	avoiding plagiarism and overreliance on any one source and following a standard format for citation.	
WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.	
New Jersey Student Learning Standards for Mathematics		
MP.2	Mathematic Modelling: Reason abstractly and quantitatively	
MP.4	Mathematic Modelling: Model with mathematics.	
Enduring Understandings		Essential Questions
<ul style="list-style-type: none"> The path of the Forensic Pathologist is one of academic rigor with the requirements being as demanding as those of a medical doctor. The role of the Forensic Pathologist is one of the most crucial in the realm of Forensics because they make the decision as to whether a homicide investigation will be conducted when they determine cause and manner of death. In the determination of cause and manner of death, Forensic Toxicology often comes into play in the determining whether or not drugs, poisons, or alcohol may have been involved. In some instances, a Forensic Entomologist is consulted with in the determination of the time of death when the process of decomposition has set in and insects begin to appear on the corpse. 		<ul style="list-style-type: none"> What is the role of the Forensic Pathologist in Forensics? How is a medical exam conducted by a Forensic Pathologist? What is the difference between Cause and Manner of Death? Of what significance can a time of death determination be in a homicide investigation? In what instances will input from a Forensic Toxicologist prove fruitful? When and how can a Forensic Entomologist provide input with regard to the time of death determination?
Concepts		Formative Assessment
<ul style="list-style-type: none"> Scientific Method Forensics Triangle Crime Scene Protocol Analysis of Evidence Forensic Pathology Medical Exam Cause and Manner of Death Autopsy Forensic Toxicology Forensic Entomology 		<ul style="list-style-type: none"> Case Study Question Sheets and Forensic Triangle Completion Laboratory Activities Crime Scene Simulations Virtual Medical Exams Terminology Review Puzzles
Suggested Learning Activities		
<ul style="list-style-type: none"> Video Lesson Case Studies: <ul style="list-style-type: none"> Lesson depicts the roles of the Investigating Detective and Crime Scene Investigators. Lesson depicts the role of the Medical Examiner and various other contributing Forensic Scientists specific to the unit being explored. Crime Scene Simulation: Students exert efforts interacting with virtual medical examiners to identify clues as to causes and manners of death. Forensic Pathology Test: Students will be tested on their knowledge of Forensic Pathology. Forensic Toxicology Test: Students will be tested on their knowledge of Forensic Toxicology. Forensic Entomology Quiz: Students will be quizzed on their understanding of Forensic Entomology. Forensic Career Exploration Writing Endeavor: Students will look at various local, state, and federal agencies in the US which employ professionals in the fields of the Forensic Sciences, discuss the agencies role in society along with the professional's role in the agency. 		
Performance Expectations		
Science and Engineering Practices	DCI	Crosscutting Concepts
<ul style="list-style-type: none"> Asking questions Planning and carrying out investigations Analyzing and Interpreting data Using Mathematics and 	<ul style="list-style-type: none"> Physical Sciences: HS – PS2-1,2, 3 Life Sciences: HS-LS1-1, 2 Engineering, Technology, and Applications of Science: HS-ETS1-3, 4 	<ul style="list-style-type: none"> Patterns Cause and Effect: Mechanism and Explanation Scale, Proportion, and Quantity

computational thinking • Constructing explanations • Engaging in argument from evidence • Obtaining, evaluating, and communicating information	• Chemistry: HS-PS1-2	
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21st Century Career Ready Practices

- CRP1.** Act as a responsible and contributing citizen and employee.
- CRP2.** Apply appropriate academic and technical skills.
- CRP3.** Attend to personal health and financial well-being.
- CRP4.** Communicate clearly and effectively and with reason.
- CRP5.** Consider the environmental, social and economic impacts of decisions.
- CRP6.** Demonstrate creativity and innovation.
- CRP7.** Employ valid and reliable research strategies.
- CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP9.** Model integrity, ethical leadership and effective management.
- CRP10.** Plan education and career paths aligned to personal goals.
- CRP11.** Use technology to enhance productivity.
- CRP12.** Work productively in teams while using cultural global competence.

Suggested Resources

Textbooks:

- *Criminalistics, An Introduction to Forensic Science*, Richard Saferstein
- *Practical Crime Scene Analysis and Reconstruction*, Ross M. Gardner and Tom Bevel

Reference Websites:

- CSI Web Adventures: <http://forensics.rice.edu/>
- The Science Spot: <http://sciencespot.net/Pages/classforsci.html>
- Forensics Files Episodes: <https://www.youtube.com/>
- Reddy's Forensics Page: <http://www.forensicpage.com/new09.htm>
- Stephen Gallagher's Forensics Science at Harry S. Truman's High School: <https://sites.google.com/site/crimesceneanalysis/home>
- FBI: <https://www.fbi.gov/services/laboratory>
- Forensics Magazine: <http://www.forensicmag.com/>
- Forensic Entomology: <http://www.forensicentomology.com/index.html>
- Virtual Medical Exam: <http://www.le.ac.uk/pa/teach/va/titlpag1.html>
- Virtual Medical Exam: <http://australianmuseum.net.au/interactive-tools/autopsy/>

Forensics

Unit Plan 8 – Forensics Anthropology and Odontology

Instructional Time: 3-4 Weeks

Description

Forensic Anthropology is the application of anthropological knowledge (related to humans) and techniques in a legal context, particularly applications of skeletal biology and archaeological methods towards the identification and cause of death of skeletal remains, as well as the recovery of remains using archaeological techniques. The Forensic Odontologist uses their expertise in dentistry to identify the deceased based on dental comparisons with dental records and to identify bite marks and other evidence-related sources of dental impressions and match them with the dentistry of the individual who produced them. They can also use their skills to identify the age of decomposed victims which still have their teeth. They often work together with the Forensic Anthropologist in the analysis of skeletal remains.

Student Learning Objectives

- Explore the roles of the Forensic Anthropologist and the Forensic Odontologist in the realm of CSI.
- Explain and understand what the Forensic Anthropologist and Forensic Odontologist can tell us about skeletal remains.
- Engage in some basic Forensic Anthropological learning activities where different bones are analyzed for correlation with an individual's height.

New Jersey Student Learning Standards

New Jersey Student Learning Standards for Science/NGSS

HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

New Jersey Student Learning Standards for 21st Century Life and Careers

9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.
9.3.LW-ENF.13	Demonstrate procedures to assist individuals requiring special assistance from law enforcement personnel.
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.

New Jersey Student Learning Standards for Technology

8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
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New Jersey Student Learning Standards for English Language Arts

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.
WHST.9-12.1	Write arguments focused on discipline-specific content.
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.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.
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.

New Jersey Student Learning Standards for Mathematics

MP.2	Mathematic Modelling: Reason abstractly and quantitatively
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MP.4	Mathematic Modelling: Model with mathematics.	
Enduring Understandings		Essential Questions
<ul style="list-style-type: none"> Forensic Anthropology and Forensic Odontology often play a crucial role initiating investigations involving skeletal remains. Individuals can often be bitten during violent assaults and it is the role of the Forensic Odontologist to shed light on such scenarios. 		<ul style="list-style-type: none"> What insight into an investigation involving skeletal remains can the Forensic Anthropologist and Odontologist provide? How might a Forensic Odontologist evaluate potential bite marks in a victim? How can DNA be obtained from skeletal remains?
Concepts		Formative Assessment
<ul style="list-style-type: none"> Scientific Method Forensics Triangle Crime Scene Protocol and Analysis of Evidence Forensic Anthropology Forensic Odontology Identification of Human Remains Decomposition Processing DNA from skeletal remains Bite mark analysis 		<ul style="list-style-type: none"> Case Study Question Sheets and Forensic Triangle Completion Laboratory Activities Crime Scene Simulations Terminology Review Puzzles
Suggested Learning Activities		
<ul style="list-style-type: none"> Video Lesson Case Studies: <ul style="list-style-type: none"> Lesson depicts the roles of the Investigating Detective and Crime Scene Investigators. Lesson depicts the role of the Medical Examiner and various other contributing Forensic Scientists specific to the unit being explored. Laboratory Activities: Students will exercise the application of Forensic Anthropological knowledge towards the correlations of different bone sizes with individual height. Forensic Anthropology Test: Students will be tested on their knowledge of Forensic Anthropology. Forensic Odontology Test: Students will be tested on their knowledge of Forensic Odontology. Forensic Career Exploration Writing Endeavor: Students will look at various local, state, and federal agencies in the US which employ professionals in the fields of the Forensic Sciences, discuss the agencies role in society along with the professional's role in the agency 		
Performance Expectations		
Science and Engineering Practices	DCI	Crosscutting Concepts
<ul style="list-style-type: none"> Asking questions Planning and carrying out investigations Analyzing and Interpreting data Using Mathematics and computational thinking Constructing explanations Engaging in argument from evidence Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> Physical Sciences: HS – PS2-1, 2, 3 Life Sciences: HS-LS1-1, 2 Engineering, Technology, and Applications of Science: HS-ETS1-3, 4 Chemistry: HS-PS1-2 	<ul style="list-style-type: none"> Patterns Cause and Effect: Mechanism and Explanation Scale, Proportion, and Quantity
21st Century Career Ready Practices		
<p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p> <p>CRP3. Attend to personal health and financial well-being.</p> <p>CRP4. Communicate clearly and effectively and with reason.</p> <p>CRP5. Consider the environmental, social and economic impacts of decisions.</p> <p>CRP6. Demonstrate creativity and innovation.</p> <p>CRP7. Employ valid and reliable research strategies.</p> <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>CRP9. Model integrity, ethical leadership and effective management.</p>		

CRP10. Plan education and career paths aligned to personal goals.

CRP11. Use technology to enhance productivity.

CRP12. Work productively in teams while using cultural global competence.

Suggest Resources

Textbooks:

- *Criminalistics, An Introduction to Forensic Science*, Richard Saferstein
- *Practical Crime Scene Analysis and Reconstruction*, Ross M. Gardner and Tom Bevel

Reference Websites:

- CSI Web Adventures: <http://forensics.rice.edu/>
- The Science Spot: <http://sciencespot.net/Pages/classforsci.html>
- Forensics Files Episodes: <https://www.youtube.com/>
- Reddy's Forensics Page: <http://www.forensicpage.com/new09.htm>
- Stephen Gallagher's Forensics Science at Harry S. Truman's High School: <https://sites.google.com/site/crimesceneanalysis/home>
- FBI: <https://www.fbi.gov/services/laboratory>
- Forensics Magazine: <http://www.forensicmag.com/>
- Forensic Anthropology Activity: http://forensics.rice.edu/en/materials/activity_nine.pdf

Forensics

Unit Plan 9 – Forensics Blood Spatter Analysis

Instructional Time: 1-2 Weeks

Description

The crime scene investigator must not overlook the fact that the location, distribution, and appearance of bloodstains and spatters may be useful for interpreting and reconstructing the events that must have occurred to produce the bleeding. It is expected that one to two weeks be spent on this unit.

Student Learning Objectives

- Explain how a Forensic Investigator can use bloodstain patterns to analyze a crime scene.
- Evaluate blood spatter as Passive, Projected, and transfer/Contact bloodstains.
- Engage in the determination of Areas of origin and Angles of Impact pertaining to bloodstain patterns.

New Jersey Student Learning Standards

New Jersey Student Learning Standards for Science/NGSS

HS-PS2-2	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
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New Jersey Student Learning Standards for 21st Century Life and Careers

9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.
9.3.LW-ENF.13	Demonstrate procedures to assist individuals requiring special assistance from law enforcement personnel.
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.

New Jersey Student Learning Standards for Technology

8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
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New Jersey Student Learning Standards for English Language Arts

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.
WHST.9-12.1	Write arguments focused on discipline-specific content.
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.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.
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.

New Jersey Student Learning Standards for Mathematics

MP.2	Mathematic Modelling: Reason abstractly and quantitatively
MP.4	Mathematic Modelling: Model with mathematics.

Enduring Understanding

- The location and description of individual stains and patterns, the directions blood droplets were traveling, and the area of origin of blood source or sources provide insight to the Blood Spatter Analyst and CSI as to types of objects used in attacks (edged, blunt, firearm, etc.), the positions of the victim, suspect, and objects during events and the ever important sequence of events (Crime Scene reconstruction).

Essential Questions

- How can an investigator use bloodstain patterns to analyze a crime scene?
- What is meant by the term “Area of Origin”?
- How can an investigator determine the “Angle of Impact” for a projected blood droplet?

Concepts		Formative Assessment	
<ul style="list-style-type: none"> Blood Spatter Area of origin Angle of Impact Passive, Projected, and Transfer/Contact Bloodstains Cast-Off Luminol 		<ul style="list-style-type: none"> Case Study Question Sheets and Forensic Triangle Completion Laboratory Activities Crime Scene Simulations Terminology Review Puzzles 	
Suggested Learning Activities			
<ul style="list-style-type: none"> Video Lesson Case Studies: <ul style="list-style-type: none"> Lesson depicts the roles of the Investigating Detective and Crime Scene Investigators. Lesson depicts the role of the Medical Examiner and various other contributing Forensic Scientists specific to the unit being explored. Laboratory Activities: Students will exercise the application of Blood Spatter Analysis knowledge in efforts of differentiating between Passive, Projected, and Transfer/Contact Bloodstains and in analyzing Areas of Origin and Angles of Impact. Forensic Blood Spatter Test: Students will be tested on their knowledge of Blood Stain Pattern Analysis. Forensic Career Exploration Writing Endeavor: Students will look at various local, state, and federal agencies in the US which employ professionals in the fields of the Forensic Sciences, discuss the agencies role in society along with the professional's role in the agency 			
Performance Expectations			
Science and Engineering Practices	DCI	Crosscutting Concepts	
<ul style="list-style-type: none"> Asking questions Planning and carrying out investigations Analyzing and Interpreting data Using Mathematics and computational thinking Constructing explanations Engaging in argument from evidence Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> Physical Sciences: HS – PS2-1, 2, 3 Life Sciences: HS-LS1-1, 2 Engineering, Technology, and Applications of Science: HS-ETS1-3-4 Chemistry: HS-PS1-2 	<ul style="list-style-type: none"> Patterns Cause and Effect: Mechanism and Explanation Scale, Proportion, and Quantity 	
21 st Century Career Ready Practices			
<p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p> <p>CRP3. Attend to personal health and financial well-being.</p> <p>CRP4. Communicate clearly and effectively and with reason.</p> <p>CRP5. Consider the environmental, social and economic impacts of decisions.</p> <p>CRP6. Demonstrate creativity and innovation.</p> <p>CRP7. Employ valid and reliable research strategies.</p> <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>CRP9. Model integrity, ethical leadership and effective management.</p> <p>CRP10. Plan education and career paths aligned to personal goals.</p> <p>CRP11. Use technology to enhance productivity.</p> <p>CRP12. Work productively in teams while using cultural global competence.</p>			
Suggested Resources			

Textbooks:

- *Criminalistics, An Introduction to Forensic Science*, Richard Saferstein
- *Practical Crime Scene Analysis and Reconstruction*, Ross M. Gardner and Tom Bevel

Reference Websites:

- CSI Web Adventures: <http://forensics.rice.edu/>
- The Science Spot: <http://sciencespot.net/Pages/classforsci.html>
- Forensics Files Episodes: <https://www.youtube.com/>
- Reddy's Forensics Page: <http://www.forensicpage.com/new09.htm>
- Stephen Gallagher's Forensics Science at Harry S. Truman's High School: <https://sites.google.com/site/crimesceneanalysis/home>
- FBI: <https://www.fbi.gov/services/laboratory>
- Forensics Magazine: <http://www.forensicmag.com/>
- Blood Spatter Analysis (MNBCA): <https://dps.mn.gov/divisions/bca/bca-divisions/forensic-science/Pages/forensic-programs-crime-scene-bpa.aspx>

Forensics

Unit Plan 10 – Trace Evidence: Hairs and Fibers

Instructional Time: 1 Week

Description

Locard’s Exchange Principle can be summarized as “every contact leaves a trace”. Often trace of this contact comes in the form of hair and fiber evidence. While not always providing the individual class characteristics so often sought after by the Forensic Investigator, this type of evidence often proves valuable toward the completion of the Forensics Triangle. It is expected that one week be spent on this unit.

Student Learning Objectives

- Explain the value of hair and fiber related evidence to the Forensic Scientist.
- Engage in Microscopic analysis of hairs and fibers.
- Elaborate as to how hair evidence can be used in terms of its class characteristics, but can only be used in terms of individual characteristics through DNA analyses.

New Jersey Student Learning Standards

New Jersey Student Learning Standards for Science/NGSS

HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

New Jersey Student Learning Standards for 21st Century Life and Careers

9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.
9.3.LW-ENF.13	Demonstrate procedures to assist individuals requiring special assistance from law enforcement personnel.
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.

New Jersey Student Learning Standards for Technology

8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
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New Jersey Student Learning Standards for English Language Arts

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.
WHST.9-12.1	Write arguments focused on discipline-specific content.
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.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.
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.

New Jersey Student Learning Standards for Mathematics

MP.2	Mathematic Modelling: Reason abstractly and quantitatively
MP.4	Mathematic Modelling: Model with mathematics.

Enduring Understandings

- Trace evidence is physical evidence found at a crime scene in small but measurable amounts.

Essential Questions

- How might hairs and fibers end up at a crime scene?
- How does hair and fiber evidence often present itself

<ul style="list-style-type: none"> • Locard’s Exchange Principle can be summarized as “every contact leaves a trace”. • Trace evidence such as hairs and fibers often prove invaluable to the Forensic Scientist in making the connections of the Forensics Triangle. 	<p>at a crime scene?</p> <ul style="list-style-type: none"> • In what ways can hair and fiber evidence aid the CSI in the completion of the Forensics Triangle for their investigation? • What are examples of analyses that enable the Forensic Scientist to analyze hairs and fibers? 	
Concepts	Formative Assessment	
<ul style="list-style-type: none"> • Locard’s Exchange Principle • Forensics Triangle • Hairs • Fibers • Use of the Compound Microscope 	<ul style="list-style-type: none"> • Case Study Question Sheets and Forensic Triangle Completion • Laboratory Activities • Crime Scene Simulations • Terminology Review Puzzles 	
Suggested Learning Activities		
<ul style="list-style-type: none"> • Video Lesson Case Studies: <ul style="list-style-type: none"> ▪ Lesson depicts the roles of the Investigating Detective and Crime Scene Investigators. ▪ Video Lessons Case Studies: Lesson depicts the role of the Medical Examiner and various other contributing Forensic Scientists specific to the unit being explored. • Laboratory Activities: Students will exercise the use of Microscopes towards the analysis of hairs and fibers and also perform some chemistry based analytical techniques to distinguish between different types of fibers, both natural and synthetic. • Forensic Hair and Fiber Test: Students will be tested on their knowledge of hairs and fibers. • Forensic Career Exploration Writing Endeavor: Students will look at various local, state, and federal agencies in the US which employ professionals in the fields of the Forensic Sciences, discuss the agencies role in society along with the professional's role in the agency. 		
Performance Expectations		
Science and Engineering Practices	DCI	Crosscutting Concepts
<ul style="list-style-type: none"> • Asking questions • Planning and carrying out investigations • Analyzing and Interpreting data • Using Mathematics and computational thinking • Constructing explanations • Engaging in argument from evidence • Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> • Physical Sciences: HS – PS2-1,2, 3 • Life Sciences: HS-LS1-1, 2 • Engineering, Technology, and Applications of Science: HS-ETS1-3, 4 • Chemistry: HS-PS1-2 	<ul style="list-style-type: none"> • Patterns • Cause and Effect: Mechanism and Explanation • Scale, Proportion, and Quantity
21st Century Career Ready Practices		
<p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p> <p>CRP3. Attend to personal health and financial well-being.</p> <p>CRP4. Communicate clearly and effectively and with reason.</p> <p>CRP5. Consider the environmental, social and economic impacts of decisions.</p> <p>CRP6. Demonstrate creativity and innovation.</p> <p>CRP7. Employ valid and reliable research strategies.</p> <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>CRP9. Model integrity, ethical leadership and effective management.</p> <p>CRP10. Plan education and career paths aligned to personal goals.</p> <p>CRP11. Use technology to enhance productivity.</p> <p>CRP12. Work productively in teams while using cultural global competence.</p>		
Suggested Resources		
<p><i>Textbooks:</i></p> <ul style="list-style-type: none"> • <i>Criminalistics, An Introduction to Forensic Science</i>, Richard Saferstein 		

- *Practical Crime Scene Analysis and Reconstruction*, Ross M. Gardner and Tom Bevel

Reference Websites:

- CSI Web Adventures: <http://forensics.rice.edu/>
- The Science Spot: <http://sciencespot.net/Pages/classforsci.html>
- Forensics Files Episodes: <https://www.youtube.com/>
- Reddy's Forensics Page: <http://www.forensicpage.com/new09.htm>
- Stephen Gallagher's Forensics Science at Harry S. Truman's High School: <https://sites.google.com/site/crimesceneanalysis/home>
- FBI: <https://www.fbi.gov/services/laboratory>
- Forensics Magazine: <http://www.forensicmag.com/>
- Hairs and Fibers: <http://www.exploreforensics.co.uk/hair-and-fibres.html>

Forensics	
Unit Plan 11 – Arson and Explosives Investigation	Instructional Time: 2 Weeks
Description	
Any fire that is set deliberately is considered arson. Sometimes such fires are set to destroy property, do bodily harm, or cover up some other type of crime. Explosives serve many purposes but can be used by the criminal to gain access, destroy property, and do bodily harm, as well. Scientifically, what fire and explosions have in common is a release of chemical energy. It is expected that at least two weeks be spent on this unit.	
Student Learning Objectives	
<ul style="list-style-type: none"> • Understand and explain how the combustion reaction applies to arson and explosions. • Elaborate upon signs of arson. • Explore case study investigations involving arson and explosives. 	
New Jersey Student Learning Standards	
New Jersey Student Learning Standards for Science/NGSS	
HS-PS3-1	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
HS-PS3-4	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
New Jersey Student Learning Standards for 21st Century Life and Careers	
9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.
9.3.LW-ENF.13	Demonstrate procedures to assist individuals requiring special assistance from law enforcement personnel.
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.
New Jersey Student Learning Standards for Technology	
8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
New Jersey Student Learning Standards for English Language Arts	
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.
WHST.9-12.1	Write arguments focused on discipline-specific content.
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.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.
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
New Jersey Student Learning Standards for Mathematics	

MP.2	Mathematic Modelling: Reason abstractly and quantitatively	
MP.4	Mathematic Modelling: Model with mathematics.	
Enduring Understanding		Essential Questions
<ul style="list-style-type: none"> Both fire and explosions involve energy releasing chemical reactions. Understanding some of the basics with regard to what to look for in cases where arson and explosives have been utilized make for better Forensic Scientists. 		<ul style="list-style-type: none"> What is a combustion reaction? How does the Fire Triangle explain what is needed for there to be fire? What are the signs of arson? How are investigations involving explosive conducted?
Concepts		Formative Assessment
<ul style="list-style-type: none"> Combustion reaction Arson Fire Triangle Accelerants Point of Origin Explosives Primary Explosives Secondary Explosives 		<ul style="list-style-type: none"> Case Study Question Sheets and Forensic Triangle Completion Laboratory Activities Crime Scene Simulations Terminology Review Puzzles
Suggested Learning Activities		
<ul style="list-style-type: none"> Video Lesson Case Studies: <ul style="list-style-type: none"> Lesson depicts the roles of the Investigating Detective and Crime Scene Investigators. Lesson depicts the role of the Medical Examiner and various other contributing Forensic Scientists specific to the unit being explored. Laboratory Activities: Students will perform safe chemistry experiments to better understand the combustion reaction. Forensic Arson and Explosives Test: Students will be tested on their knowledge of arson and explosives investigation. Forensic Career Exploration Writing Endeavor: Students will look at various local, state, and federal agencies in the US which employ professionals in the fields of the Forensic Sciences, discuss the agencies role in society along with the professional's role in the agency. 		
Performance Expectations		
Science and Engineering Practices	DCI	Crosscutting Concepts
<ul style="list-style-type: none"> Asking questions Planning and carrying out investigations Analyzing and Interpreting data Using Mathematics and computational thinking Constructing explanations Engaging in argument from evidence Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> Physical Sciences: HS – PS2-1, 2, 3 Life Sciences: HS-LS1-1, 2 Engineering, Technology, and Applications of Science: HS-ETS1-3, 4 Chemistry: HS-PS1-2 	<ul style="list-style-type: none"> Patterns Cause and Effect: Mechanism and Explanation Scale, Proportion, and Quantity
English/Language Arts Standards		Mathematics Standards
Analyzing, Evaluating, Summarizing, Presenting Technical Information: <ul style="list-style-type: none"> RST.11-12.1 WHST.9-12.2, 12.7, 12.9 WHST.11-12.8 WHST.9-12.9 SL.11-12.5 		Mathematical Modelling: <ul style="list-style-type: none"> MP.2 MP.4
21st Century Career Ready Practices		

- CRP1.** Act as a responsible and contributing citizen and employee.
- CRP2.** Apply appropriate academic and technical skills.
- CRP3.** Attend to personal health and financial well-being.
- CRP4.** Communicate clearly and effectively and with reason.
- CRP5.** Consider the environmental, social and economic impacts of decisions.
- CRP6.** Demonstrate creativity and innovation.
- CRP7.** Employ valid and reliable research strategies.
- CRP8.** Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP9.** Model integrity, ethical leadership and effective management.
- CRP10.** Plan education and career paths aligned to personal goals.
- CRP11.** Use technology to enhance productivity.
- CRP12.** Work productively in teams while using cultural global competence.

Suggested Resources

Textbooks:

- *Criminalistics, An Introduction to Forensic Science*, Richard Saferstein
- *Practical Crime Scene Analysis and Reconstruction*, Ross M. Gardner and Tom Bevel

Reference Websites:

- CSI Web Adventures: <http://forensics.rice.edu/>
- The Science Spot: <http://sciencespot.net/Pages/classforsci.html>
- Forensics Files Episodes: <https://www.youtube.com/>
- Reddy's Forensics Page: <http://www.forensicpage.com/new09.htm>
- Stephen Gallagher's Forensics Science at Harry S. Truman's High School: <https://sites.google.com/site/crimesceneanalysis/home>
- FBI: <https://www.fbi.gov/services/laboratory>
- Forensics Magazine: <http://www.forensicmag.com/>
- Essex County Sheriffs : <http://www.essexsheriff.com/>
- New Jersey State Police: <http://njsp.org/>
- ATF: <https://www.atf.gov/>

Forensics	
Unit 12: Auto Accident Reconstruction	Instructional Time: 1-2 Weeks
Description	
Vehicular accident reconstruction is the scientific process of investigating, analyzing, and drawing conclusions about the causes and events of a vehicular collision. Forensic investigators are employed to conduct in-depth collision analysis to identify the causes of collisions, including the role of the driver, vehicle, road condition and the environment.	
Student Learning Objectives	
<ul style="list-style-type: none"> • Explain the steps taken by the Vehicular Accident Reconstructionist in their investigative efforts. • Extend the applications of Newton’s Three Laws, the Law of Conservation of Momentum, and concepts of friction to scenarios involving auto accident reconstruction. • Evaluate auto collision scenarios based on skid mark analysis techniques. 	
New Jersey Student Learning Standards	
New Jersey Student Learning Standards for Science/NGSS	
HS-PS2-1	Analyze data to support the claim that Newton’s second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
HS-PS2-2	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
HS-PS3-1	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
New Jersey Student Learning Standards for 21st Century Life and Careers	
9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.
9.3.LW-ENF.13	Demonstrate procedures to assist individuals requiring special assistance from law enforcement personnel.
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.
New Jersey Student Learning Standards for Technology	
8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
New Jersey Student Learning Standards for English Language Arts	
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.
WHST.9-12.1	Write arguments focused on discipline-specific content.
WHST.11-12.2.d.	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.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.
WHST.11-12.8.	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9.	Draw evidence from informational texts to support analysis, reflection, and research.
New Jersey Student Learning Standards for Mathematics	
MP.2	Mathematic Modelling: Reason abstractly and quantitatively
MP.4	Mathematic Modelling: Model with mathematics.

Enduring Understandings		Essential Questions	
<ul style="list-style-type: none"> Auto Accident Reconstruction is the scientific process of investigating, analyzing, and drawing conclusions about the causes and events during a vehicle collision. Analyzing collisions involves an understanding of basic Physics concepts such as Newton’s Three Laws, the Law of Conservation of Momentum, and friction. 		<ul style="list-style-type: none"> How do the laws of Physics apply to Auto Accident Reconstruction? What data is gathered by the Vehicular Collision Investigator? What are skid marks and how can skid marks be analyzed at the scene of an auto collision? How can impairments to an individual’s reflexes affect stopping distance? 	
Concepts		Formative Assessment	
<ul style="list-style-type: none"> Auto Accident Reconstruction Newton’s Three Laws of Motion The Law of conservation of Momentum Skid Mark Analysis Stopping Distance 		<ul style="list-style-type: none"> Case Study Question Sheets and Forensic Triangle Completion Laboratory Activities Crime Scene Simulations Terminology Review Puzzles 	
Suggested Learning Activities			
<ul style="list-style-type: none"> Video Lesson Case Studies: <ul style="list-style-type: none"> Lesson depicts the roles of the Investigating Detective and Crime Scene Investigators. Lesson depicts the role of the Medical Examiner and various other contributing Forensic Scientists specific to the unit being explored. Laboratory Activities: <ul style="list-style-type: none"> Students will perform Physics experiments in the areas of Newton’s Three Laws and the Law of Conservation of Momentum so as to better understand these Physics concepts as they apply to Auto Accident Reconstruction. Students will analyze skid marks to estimate speed of travel prior to application of breaks. Forensic Auto Accident Reconstruction Test– Students will be tested on their knowledge of auto accident reconstruction. Forensic Career Exploration Writing Endeavor: Students will look at various local, state, and federal agencies in the US which employ professionals in the fields of the Forensic Sciences, discuss the agencies role in society along with the professional's role in the agency. 			
Performance Expectations			
Science and Engineering Practices	DCI	Crosscutting Concepts	
<ul style="list-style-type: none"> Asking questions Planning and carrying out investigations Analyzing and Interpreting data Using Mathematics and computational thinking Constructing explanations Engaging in argument from evidence Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> Physical Sciences: HS – PS2-1, 2, 3 Life Sciences: HS-LS1-1, 2 Engineering, Technology, and Applications of Science: HS-ETS1-3-4 Chemistry: HS-PS1-2 	<ul style="list-style-type: none"> Patterns Cause and Effect: Mechanism and Explanation Scale, Proportion, and Quantity 	
21 st Century Career Ready Practices			
<p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p> <p>CRP3. Attend to personal health and financial well-being.</p> <p>CRP4. Communicate clearly and effectively and with reason.</p> <p>CRP5. Consider the environmental, social and economic impacts of decisions.</p> <p>CRP6. Demonstrate creativity and innovation.</p> <p>CRP7. Employ valid and reliable research strategies.</p> <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>CRP9. Model integrity, ethical leadership and effective management.</p>			

CRP10. Plan education and career paths aligned to personal goals.

CRP11. Use technology to enhance productivity.

CRP12. Work productively in teams while using cultural global competence.

Suggested Resources

Textbooks:

- *Criminalistics, An Introduction to Forensic Science*, Richard Saferstein
- *Practical Crime Scene Analysis and Reconstruction*, Ross M. Gardner and Tom Bevel

Reference Websites:

- CSI Web Adventures: <http://forensics.rice.edu/>
- The Science Spot: <http://sciencespot.net/Pages/classforsci.html>
- Forensics Files Episodes: <https://www.youtube.com/>
- Reddy's Forensics Page: <http://www.forensicpage.com/new09.htm>
- Stephen Gallagher's Forensics Science at Harry S. Truman's High School: <https://sites.google.com/site/crimesceneanalysis/home>
- FBI: <https://www.fbi.gov/services/laboratory>
- Forensics Magazine: <http://www.forensicmag.com/>
- Auto Accident Reconstruction Activity: <http://resources.edb.hkedcity.net/gifted/ForensicSci/>

Forensics	
Unit Plan 13 – Voice and Questioned Documents - Handwriting Analysis	Instructional Time: 1 Week
Description	
Handwriting analysis often comes into play when documents are forged during fraudulent activities and attempts to throw off Investigators. Being able to accurately compare and contrast the penmanship between two documents of concern is crucial for the criminologist with expertise in this area. The analysis of voice recordings is essential when attempting to identify perpetrators, especially during the phone tapping activities carried out by authorities in the fight against organized crime under the Federal RICO act.	
Student Learning Objectives	
<ul style="list-style-type: none"> • Explore applications of Questioned Document analysis in Forensic Investigations. • Elaborate upon scenarios regarding criminal surveillance and analysis of 911 calls in the context of Forensic Voice Analysis. • Explore handwriting analysis. 	
New Jersey Student Learning Standards	
New Jersey Student Learning Standards for Science/NGSS	
HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS-PS4-5	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.
New Jersey Student Learning Standards for 21st Century Life and Careers	
9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.
9.3.LW-ENF.13	Demonstrate procedures to assist individuals requiring special assistance from law enforcement personnel.
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.
New Jersey Student Learning Standards for Technology	
8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
New Jersey Student Learning Standards for English Language Arts	
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.
WHST.9-12.1	Write arguments focused on discipline-specific content.
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
WHST.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.
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
New Jersey Student Learning Standards for Mathematics	
MP.2	Mathematic Modelling: Reason abstractly and quantitatively
MP.4	Mathematic Modelling: Model with mathematics.
Enduring Understandings	
<ul style="list-style-type: none"> • A questioned document is one that in its entirety or in 	
Essential Questions	
<ul style="list-style-type: none"> • What does the Questioned Documents Analyzer look 	

<p>part is suspect as to authenticity or origin.</p> <ul style="list-style-type: none"> • Questioned documents often present themselves during criminal investigations. • Voice recording are often analyzed during criminal investigations. 	<p>for in questioned documents?</p> <ul style="list-style-type: none"> • What types of Laboratory Equipment are used in Questioned Documents Analysis? • When might it be required to analyze voice recordings in an Investigation? 	
Concepts	Formative Assessment	
<ul style="list-style-type: none"> • Questioned documents • Handwriting analysis • Voice recording analysis 	<ul style="list-style-type: none"> • Case Study Question Sheets and Forensic Triangle Completion • Laboratory Activities • Crime Scene Simulations • Terminology Review Puzzles 	
Suggested Learning Activities		
<ul style="list-style-type: none"> • Video Lesson Case Studies: Lesson depicts the roles of the Investigating Detective and Crime Scene Investigators. • Video Lessons Case Studies: Lesson depicts the role of the Medical Examiner and various other contributing Forensic Scientists specific to the unit being explored. • Laboratory Activities: Students will exercise handwriting analysis skills. • Forensic Career Exploration Writing Endeavor: Students will look at various local, state, and federal agencies in the US which employ professionals in the fields of the Forensic Sciences, discuss the agencies role in society along with the professional's role in the agency. 		
Performance Expectations		
Science and Engineering Practices	DCI	Crosscutting Concepts
<ul style="list-style-type: none"> • Asking questions • Planning and carrying out investigations • Analyzing and Interpreting data • Using Mathematics and computational thinking • Constructing explanations • Engaging in argument from evidence • Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> • Physical Sciences: HS – PS2-1, 2, 3 • Life Sciences: HS-LS1-1, 2 • Engineering, Technology, and Applications of Science: HS-ETS1-3, 4 • Chemistry: HS-PS1-2 	<ul style="list-style-type: none"> • Patterns • Cause and Effect: Mechanism and Explanation • Scale, Proportion, and Quantity
21st Century Career Ready Practices		
<p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p> <p>CRP3. Attend to personal health and financial well-being.</p> <p>CRP4. Communicate clearly and effectively and with reason.</p> <p>CRP5. Consider the environmental, social and economic impacts of decisions.</p> <p>CRP6. Demonstrate creativity and innovation.</p> <p>CRP7. Employ valid and reliable research strategies.</p> <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>CRP9. Model integrity, ethical leadership and effective management.</p> <p>CRP10. Plan education and career paths aligned to personal goals.</p> <p>CRP11. Use technology to enhance productivity.</p> <p>CRP12. Work productively in teams while using cultural global competence.</p>		
Suggested Resources		
<p><i>Textbooks:</i></p> <ul style="list-style-type: none"> • <i>Criminalistics, An Introduction to Forensic Science</i>, Richard Saferstein • <i>Practical Crime Scene Analysis and Reconstruction</i>, Ross M. Gardner and Tom Bevel <p><i>Reference Websites:</i></p> <ul style="list-style-type: none"> • CSI Web Adventures: http://forensics.rice.edu/ 		

- The Science Spot: <http://sciencespot.net/Pages/classforsci.html>
- Forensics Files Episodes: <https://www.youtube.com/>
- Reddy's Forensics Page: <http://www.forensicpage.com/new09.htm>
- Stephen Gallagher's Forensics Science at Harry S. Truman's High School: <https://sites.google.com/site/crimesceneanalysis/home>
- FBI: <https://www.fbi.gov/services/laboratory>
- Forensics Magazine: <http://www.forensicmag.com/>
- Questioned Documents: <http://science.howstuffworks.com/handwriting-analysis.htm>

Forensics			
Unit Plan 14 – Criminal Profiling 2	Instructional Time: 2 Weeks		
Description			
Both Psychology and Psychiatry involve the study of human behavior and factors that affect it. Both come into play with questioning witnesses, questioning and interrogating persons of interest, criminal profiling and investigating serial criminals. Additionally, insight into the criminal mind can often help with the <i>who, what, where, when, and why</i> aspects of a criminal investigation.			
Student Learning Objectives			
<ul style="list-style-type: none"> • Explain the difference between Psychology and Psychiatry as they relate to the Forensic Sciences. • Explore case studies and investigations that have been concluded through the use Criminal Profiling inclusive of related Forensic Psychology and Psychiatry techniques. • Evaluate the applications of Forensic Psychology, Psychiatry, and Criminal Profiling in the study of serial criminals. 			
New Jersey Student Learning Standards			
New Jersey Student Learning Standards for 21st Century Life and Careers			
9.3.LW-ENF.10	Demonstrate the routine day-to-day tasks conducted by various law enforcement agencies.		
9.3.LW-ENF.12	Demonstrate the procedures to properly protect, document and process the crime scene and all related evidence.		
9.3.LW-ENF.13	Demonstrate procedures to assist individuals requiring special assistance from law enforcement personnel.		
9.3.LW-LEG.5	Analyze the role forensics plays in preventing and solving crimes.		
New Jersey Student Learning Standards for Social Studies			
6.1.4.D.19	Explain how experiences and events may be interpreted differently by people with different cultural or individual perspectives		
New Jersey Student Learning Standards for English Language Arts			
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.		
WHST.9-12.1	Write arguments focused on discipline-specific content.		
WHST.11-12.2.d	Write informative/explanatory texts, including technical processes using precise language, domain-specific vocabulary to convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.		
WHST.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.		
WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.		
WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.		
New Jersey Student Learning Standards for Mathematics			
MP.2	Mathematic Modelling: Reason abstractly and quantitatively		
MP.4	Mathematic Modelling: Model with mathematics.		
Enduring Understandings			
<ul style="list-style-type: none"> • Criminal Profiling, Forensic Psychology and Psychiatry can help the criminalist: <ul style="list-style-type: none"> ▪ Identify potential persons of interest, ▪ Develop questioning strategies ▪ Investigate serial criminals and their crimes. 	Essential Questions		
		<ul style="list-style-type: none"> • What is a Criminal Profiler and under what circumstances might they be called upon in an Investigation? • What facets of Forensic Psychology and Psychiatry are utilized by the Criminal Profiler? • Why would society want to better understand the “why?” of a criminal act? 	
Concepts		Formative Assessment	
<ul style="list-style-type: none"> • Forensic Psychology • Forensic Psychiatry 		<ul style="list-style-type: none"> • Case Study Question Sheets and Forensic Triangle Completion 	

<ul style="list-style-type: none"> • Criminal Profiling • Method of Operation (Modus Operandi) • Signature 	<ul style="list-style-type: none"> • Laboratory Activities • Crime Scene Simulations • Terminology Review Puzzles 	
Suggested Learning Activities		
<ul style="list-style-type: none"> • Video Lesson Case Studies: <ul style="list-style-type: none"> ▪ Lesson depicts the roles of the Investigating Detective and Crime Scene Investigators. ▪ Lesson depicts the role of the Medical Examiner and various other contributing Forensic Scientists specific to the unit being explored. • Laboratory Activities: Students will research the Psychological details of numerous cases involving serial criminals. • Forensic Career Exploration Writing Endeavor: Students will look at various local, state, and federal agencies in the US which employ professionals in the fields of the Forensic Sciences, discuss the agencies role in society along with the professional's role in the agency. 		
Performance Expectations		
Science and Engineering Practices	DCI	Crosscutting Concepts
<ul style="list-style-type: none"> • Asking questions • Planning and carrying out investigations • Analyzing and Interpreting data • Using Mathematics and computational thinking • Constructing explanations • Engaging in argument from evidence • Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> • Physical Sciences: HS – PS2-1,2,3 • Life Sciences: HS-LS1-1, 2 • Engineering, Technology, and Applications of Science: HS-ETS1-3-4 • Chemistry: HS-PS1-2 	<ul style="list-style-type: none"> • Patterns • Cause and Effect: Mechanism and Explanation • Scale, Proportion, and Quantity
21st Century Career Ready Practices		
<p>CRP1. Act as a responsible and contributing citizen and employee.</p> <p>CRP2. Apply appropriate academic and technical skills.</p> <p>CRP3. Attend to personal health and financial well-being.</p> <p>CRP4. Communicate clearly and effectively and with reason.</p> <p>CRP5. Consider the environmental, social and economic impacts of decisions.</p> <p>CRP6. Demonstrate creativity and innovation.</p> <p>CRP7. Employ valid and reliable research strategies.</p> <p>CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.</p> <p>CRP9. Model integrity, ethical leadership and effective management.</p> <p>CRP10. Plan education and career paths aligned to personal goals.</p> <p>CRP11. Use technology to enhance productivity.</p> <p>CRP12. Work productively in teams while using cultural global competence.</p>		
Suggested Resources		
<p><i>Textbooks:</i></p> <ul style="list-style-type: none"> • <i>Criminalistics, An Introduction to Forensic Science</i>, Richard Saferstein • <i>Practical Crime Scene Analysis and Reconstruction</i>, Ross M. Gardner and Tom Bevel <p><i>Reference Websites:</i></p> <ul style="list-style-type: none"> • CSI Web Adventures: http://forensics.rice.edu/ • The Science Spot: http://sciencespot.net/Pages/classforsci.html • Forensics Files Episodes: https://www.youtube.com/ • Reddy's Forensics Page: http://www.forensicpage.com/new09.htm • Stephen Gallagher's Forensics Science at Harry S. Truman's High School: https://sites.google.com/site/crimesceneanalysis/home • FBI: https://www.fbi.gov/services/laboratory • Forensics Magazine: http://www.forensicmag.com/ • Criminal Profiling: http://www.e-criminalpsychology.com/everything-you-need-to-know-about-becoming-a-forensic-psychologist/ 		

