HS Forensic Science

Science

Grade(s) 10th - 12th, 1 Credit
Required Course

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

<table>
<thead>
<tr>
<th>Timeframe</th>
<th>Unit</th>
<th>Instructional Topics</th>
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| 1 Week(s) | Introduction to Basic Forensic investigations | 1. History and development of Forensic Science  
2. Crime Scene  
3. Physical evidence |
| 2 Week(s) | Trace evidence | 1. Hairs and fibers  
2. Metals and paints  
3. Soils  
4. Glass |
| 3 Week(s) | Latent Marks | 1. Fingerprints  
2. Ballistics  
3. Tool marks and other impressions  
4. Document examination |
| 2 Week(s) | Serology | 1. The nature of blood and other bodily fluids.  
2. Blood Stain patterns |
| 2 Week(s) | Toxicology and Drugs | 1. Types of Drugs  
2. Forensic Drug analysis  
3. Toxicology |
| 3 Week(s) | Fire and Explosives Investigations | 1. Arson  
2. Explosions and explosives |
| Ongoing | English Language Arts within Science and Technology Content | 1. English Language Arts within Science and Technology Content |

Course Rationale
Forensic Science should be taught as a hands-on, problem-solving, investigative course that incorporates inquiry.

ACTIVITIES provided are suggested resources that can support student learning. The ultimate purpose of any activity is for students to meet the key concepts.

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

Board Approval Date
Board Approval 6/26/2014

Course Details

Unit: Introduction to Basic Forensic investigations
Duration: 1 Week(s)

Enduring Understandings
Forensic science is the application of scientific methods to solving crimes. The largest area of forensic science is criminalistics, which includes the physical evidence commonly found at crime scenes. The crime scene contains clues or evidence that help tell the story of the crime. This evidence must be recognized, carefully collected and preserved. Evidence can be classified in a number of different ways. All evidence undergoes an identification process whereby its physical and chemical characteristics are discovered and described.

Essential Questions
What is Forensic Science?
What is the protocol of a crime science?
How is evidence collected and secured?
What is chain of custody?
What are the characteristics of evidence?

Topic: History and development of Forensic Science
Duration: 0 Day(s)

Learning Targets
The student will define Forensic Science and list the major disciplines
The student will describe the services of a typical crime lab and other forensic services.
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<thead>
<tr>
<th>Topic:</th>
<th>Crime Scene</th>
<th>Duration: 0 Day(s)</th>
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<tbody>
<tr>
<td>Learning Targets</td>
<td>The student will define the concept of chain of custody.</td>
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<td></td>
<td>The student will describe proper procedures for systematic search of a crime scene.</td>
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<td>The student will describe proper techniques for collecting evidence.</td>
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<td>The student will explain the steps to be taken to thoroughly record the crime scene.</td>
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<tr>
<th>Topic:</th>
<th>Physical evidence</th>
<th>Duration: 0 Day(s)</th>
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<tbody>
<tr>
<td>Learning Targets</td>
<td>The student will define physical evidence</td>
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<td></td>
<td>The student will list and compare types of physical evidence</td>
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<td>The student will learn to assess the significance of physical evidence</td>
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Unit: Trace evidence | Duration: 2 Week(s) |

Enduring Understandings
Once evidence is collected from the crime scene it must be analyzed at the crime lab. Microscopy is used to identify and classify different hairs and fibers. Chemical methods are used to separate and identify components of metals and paints. Soil contains inorganic crushed rocks and minerals and organic decayed plants and animal material. These components can help identify a location. Glass can be classified by its components which include color, dimension and thickness, density and refractive index. The direction of force and determination to sequence can also be analyzed for glass.

Essential Questions
What is Microscopy?
How is Microscopy used to identify differences in hair and fiber?
What methods can be used to distinguish between different metals and paint samples?
What minerals can be found in samples of soil?
How are different types of glass identified?

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<tr>
<th>Topic:</th>
<th>Hairs and fibers</th>
<th>Duration: 0 Day(s)</th>
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<tbody>
<tr>
<td>Learning Targets</td>
<td>The student will describe proper technique for proper collection and preservation of hairs and fibers.</td>
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<td></td>
<td>The student will describe the difference between animal and human hair.</td>
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<td>The student will explain the difference between natural and man made fibers.</td>
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<th>Topic:</th>
<th>Metals and paints</th>
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<td>Learning Targets</td>
<td>The student will demonstrate the use of emission spectroscopy in paint evidence analysis.</td>
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<tr>
<td></td>
<td>The student will describe proper technique for proper collection and preservation of paint evidence.</td>
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<td>The student will list the most useful examinations for comparing metal and/or paint samples.</td>
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<tr>
<th>Topic:</th>
<th>Soils</th>
<th>Duration: 0 Day(s)</th>
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<td>Learning Targets</td>
<td>The student will demonstrate proper technique for proper collection and preservation of soil evidence.</td>
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<td>The student will list the important forensic properties of soils.</td>
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<tr>
<th>Topic:</th>
<th>Glass</th>
<th>Duration: 0 Day(s)</th>
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<tr>
<td>Learning Targets</td>
<td>The student will demonstrate proper technique for collection and preservation of glass evidence.</td>
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The student will demonstrate the proper examination of glass fractures.
The student will explain the different methods of glass identification.

Unit: Latent Marks

Enduring Understandings
There are many different markings that can be left at a scene of a crime. These might include fingerprints, bullet striations, marks left by weapons on a body, footprints or tire tracks, and handwriting samples. These marks can be uniquely identified and compared to standards.

Essential Questions
What makes up a fingerprint?
How are fingerprints different from one another?
What are the different types of bullets?
How does each weapon leave a different mark on a bullet?
How do forensic scientists preserve markings from weapons or from impressions?
Can someone be identified based on their handwriting?

Learning Targets
The student will demonstrate proper technique for collection and preservation of fingerprint evidence.
The student will identify the common characteristics of fingerprints.
The student will use fingerprint evidence to confirm or deny the identity of a suspect.

Topic: Fingerprints
Duration: 0 Day(s)

Learning Targets
The student will distinguish between various powder and primer residues.
The student will identify the class and characteristics of bullets and cartridge cases.
The student will identify the tests used to determine if a suspect has fired a weapon.

Topic: Ballistics
Duration: 0 Day(s)

Learning Targets
The student will demonstrate proper technique for collection and preservation of tool marks and other impressions evidence.
The student will use individual characteristics to compare footprints, toolmarks and tire impressions.

Topic: Tool marks and other impressions
Duration: 0 Day(s)

Learning Targets
The student will list the techniques examiners use to uncover alterations, erasures, obliterations, and variations in pen inks.
The student will describe the common individual characteristics associated with handwriting.

Unit: Serology

Enduring Understandings
Blood is a suspension of solid, mostly cellular material in a fluid that consists of water containing many dissolved materials. Blood can be identified and collected and then typed. Other bodily fluids can also be collected from a crime scene, victim or suspect. Besides collecting samples of bodily fluids, trajectory or patterns of blood can be analyzed to determine what happened during the crime and where individuals or other objects where located during the incident.

Essential Questions
What are the different typings of blood?
What do the different patterns of blood stains mean?
How does DNA play a role in forensics today?

Learning Targets
The student will describe the tests used to characterize a stain as blood or other bodily fluids.
The student will list the factors used to delineate blood type.

**Topic: Blood Stain patterns**

**Learning Targets**
The student will be able to identify blood stain patterns to obtain information about the crime scene.
The student will demonstrate proper technique for collection and preservation of blood evidence.

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**Enduring Understandings**
Illicit drugs are those that are either legitimately manufactured drugs taken for purposes other than what they were made for, or drugs that have no medical use. Illicit drugs fall into four classes by major effects. Illicit drugs are analyzed by forensic chemists who develop protocols for analysis that take into account the form and quantity of the drug present. Forensic toxicologists determine the presence and amounts of drugs and poisons in people and interpret their effects.

**Essential Questions**
What are the four classes of illicit drugs?
What field tests can be used to identify a drug?
What methods are used to determine if a person has consumed a drug or poison?

**Topic: Types of Drugs**

**Learning Targets**
The student will demonstrate proper technique for collection and preservation of drug evidence.
The student will compare and contrast physical and psychological drug evidence.
The student will name and classify commonly abused drugs.

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**Enduring Understandings**
The student will describe the utility of UV and IR spectroscopy for identification of organic compounds.
The student will conduct laboratory tests used for routine drug identification analysis.

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**Enduring Understandings**
Both fires and explosions arise from combustion. The differences between a fire and an explosion are the amounts of energy produced by the combustion and how the oxygen is made available for the reaction. In fires and explosions, it is critical to find the point of origin. Finding the origin can help determine the type of explosive or accelerant used.

**Essential Questions**
What is fire?
What is an explosive?
How does fire spread?
What is the Greiss test?

**Topic: Forensic Drug analysis**

**Learning Targets**
The student will describe the utility of UV and IR spectroscopy for identification of organic compounds.
The student will conduct laboratory tests used for routine drug identification analysis.

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**Enduring Understandings**
The student will conduct laboratory tests used for determining blood alcohol content.
The student will describe the physiological absorption and metabolism of alcohol.
The student will utilize identification techniques used for identifying poisons.

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**Enduring Understandings**
The student will demonstrate proper technique for collection and preservation of arson evidence.
The student will demonstrate the proper analysis of flammable residues.
The student will describe the proper technique for investigating the scene of a fire.

The student will investigate the chemistry of fire.

**Topic:** Explosions and explosives  
**Duration:** 0 Day(s)

**Learning Targets**
- The student will classify the different types of explosives.
- The student will demonstrate proper technique for proper collection and preservation of explosives evidence.
- The student will describe the laboratory procedures used to detect and identify explosive residues.

**Unit:** English Language Arts within Science and Technology Content  
**Duration:** Ongoing

**Unit Overview**
The following unit is aligned with Common Core and focused on the importance of reading and writing in the content areas. This unit is specifically focused on science and technology.

**Enduring Understandings**
Reading scientific pieces include various elements that are different than in other contents.
Writing scientific pieces has various elements that are different than in other contents.

**Essential Questions**
How do reading scientific texts vary from other content areas?
How to you express your idea and knowledge differently in scientific writings?

**Topic:** English Language Arts within Science and Technology Content  
**Duration:** Ongoing

**Learning Targets**
The student will cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

- The student will write arguments focused on discipline-specific content.
  - Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
  - Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
  - Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
  - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
  - Provide a concluding statement or section that follows from or supports the argument presented.

The student will write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

- Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

The student will write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

The student will produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

The student will develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

The student will use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
The student will 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.

The student will gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.