DEPARTMENT: **Science**   COURSE: **Forensic Science**

Curriculum Development Timeline

School: Ocean Township High School

Course: Forensic Science

Department: Science

Board Approval	Supervisor	Notes
July 2012	Patrick Sullivan	Born Date
August 2013	Patrick Sullivan	Update Standards
December 2017	Patrick Sullivan	Update Standards
August 2018	Patrick Sullivan	Revisions
August 2019	Patrick Sullivan	Review
November 2020	Patrick Sullivan	Alignment to Standards
August 2022	Patrick Sullivan	Alignment to Standards

Township of Ocean Schools

Assistant Superintendent
Office of Teaching and Learning

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Township of Ocean Pacing Guide			
Week	**Marking Period 1**	**Week**	**Marking Period 3**
1	Observation Skills	11	Blood & Blood Spatter
2	Observation Skills	12	Blood & Blood Spatter
3	Crime-Scene Investigation & Evidence Collection	13	Death: Meaning, Manner, Cause & Time
4	Crime-Scene Investigation & Evidence Collection	14	Death: Meaning, Manner, Cause & Time
5	The Study of Hair	15	Drug Identification & Toxicology
Week	**Marking Period 2**	**Week**	**Marking Period 4**
6	A Study of Fibers & Textiles	16	Forensic Anthropology: What We Learn from Bones
7	Fingerprints	17	Forensic Anthropology: What We Learn from Bones
8	DNA Fingerprinting	18	Casts & Impressions
9	DNA Fingerprinting	19	Ballistics
10	Handwriting Analysis, Forgery & Counterfeiting	20	Final Exam Project

Climate Change: Death: Meaning, Manner, Cause & Time (NJSLS-S: HS-ESS3-5)

Core Instructional & Supplemental Materials including various levels of Texts
Forensic Science: Fundamentals & Investigations, South-Western (Cengage Learning)   **Digital Resources:**   Forensic Files   CSI: NY   Bones

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NOVA:
- Forensics on Trial
- Can Science Stop Crime?
- Who Killed Lindbergh's Baby?

Streaming Video clips:
- CSI Careers - DNA Expert, Forensic Reconstruction Artist
- She was Never in My Car - Fiber Case
- Superglue Fuming Fingerprints
- DNA Fingerprinting clip

Ted Talks
PBS Documentary
Phet Simulations
Gizmos

Time Frame	2 Weeks

Topic
Observation Skills

[Alignment to Standards](#)

HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics, as well as possible social, cultural and environmental impacts.
HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Learning Objectives and Activities

Learning Objectives:
- What is the importance of laboratory safety?
- What is a forensic scientist's role when called to a court of law?
- How do emotions affect our mental state when we are observing something?
- What was the main conclusion of the Innocence Project?
- What are some ways to improve our observational skills?
- Forensic scientists find, examine and evaluate evidence by utilizing observation skills.

Learning Activities:
- Hands-On Observation Activities: Learning to See - observe photos for a short period

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of time and answer questions: Jane's Restaurant observation activity
- Cooperative Learning /Problem Solving: Deductive Reasoning lab; Death of a Lodger
- Case Studies: Innocence Project cases
- Define observation and describe what changes occur in the brain.
- Describe examples of factors influencing eyewitness accounts of events.
- Compare the reliability of eyewitness testimony to what actually happened.
- Relate observation skills to their use in forensic science.
- Define forensic science.
- Practice and improve your own observation skills.

Assessments

Formative:
- Do now questions:
  - How does observation differ from perception?
  - What is the purpose of the Innocence Project?
  - What are factors that could affect eyewitness testimony?
  - What is Forensic Science?
- Lab analysis questions
- Observation Skills activities & discussions

Summative:
- Forensic Case Studies

Benchmark:
- Forensic Science Skills Benchmark

Alternative: N/A

Interdisciplinary Connections

ELA:
LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience - each test and lab includes short answer questions.
LA.WHST.11-12.1.A: Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. Students must provide evidence to support their claims when answering lab analysis questions.

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Mathematics: N/A
Career Readiness, Life Literacies, and Key Skills
9.4.12.CI.1: Demonstrate the ability to reflect, analyze and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
Technology Integration
Career Education
CRP-2: Apply appropriate academic and technical skills. Students use knowledge and skills through their lab work. **CRP-10:** Plan education and career paths aligned to personal goals. Students research various careers involved in crime scene investigation to determine the education and daily tasks required to perform the job requirements of a person in that profession. **CRP-12:** Work productively in teams while using cultural global competence. Students work productively in collaborative groups using culturally global competence.

Time Frame	2 Weeks
Topic	
Crime-Scene Investigation and Evidence Collection	
Alignment to Standards	
HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics, as well as possible social, cultural and environmental impacts.	
Learning Objectives and Activities	
Learning Objectives: ● What are the implications in analyzing evidence relative to Locard's Exchange Principle? ● What are some examples of trace evidence? ● What are the various types of evidence? ● Why is it important to "separate the witnesses" at the crime scene?	

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- What procedures are required when collecting evidence from a crime scene?
- What are the essential elements of a crime scene sketch?
- Crime scenes must be processed in a procedural manner.
- Evidence is needed to determine the method by which a crime has been committed.

Learning Activities:
- Case studies with discussion of evidence classification, processing procedures
- Collecting & Packaging Evidence Activity
- Don't Touch the Evidence crime scene sketch lab
- Bertillon Measurement Activity
- Describe Locard's exchange principle
- Identify four examples of trace evidence
- Distinguish between direct and circumstantial evidence
- Identify the type of professionals who are present at a crime scene
- Summarize the seven steps of a crime-scene investigation
- Explain the importance of securing the crime scene
- Identify the methods by which a crime scene is documented
- Demonstrate proper technique in collecting and packaging trace evidence
- Describe how evidence from a crime scene is analyzed

Assessments

Formative:
- Do Now questions:
  - What are the goals of crime scene investigation?
  - Why are search patterns used to find evidence?
  - What are the steps of crime scene investigation?
- Lab Analysis questions
- Crime Scene Sketch Lab
- Direct vs. Circumstantial Evidence skits

Summative:
- Evidence assessment
- Crime Scene Investigation & Evidence Collection Test (short answer)

Benchmark: N/A

Alternative:
- CSI Team group presentations

Interdisciplinary Connections

DEPARTMENT: **Science**   COURSE: **Forensic Science**

ELA:
LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Each test includes short answer questions.

Mathematics: N/A

Career Readiness, Life Literacies, and Key Skills

Technology Integration

Career Education

CRP-2: Apply appropriate academic and technical skills. Students use knowledge and skills through their lab work.
CRP-4: Students communicate clearly and effectively and with reason. Students visually represent via google slides the various careers involved in crime scene investigation.
CRP-12: Work productively in teams while using cultural global competence. Students work productively in collaborative groups using culturally global competence.

Time Frame	1 Weeks
Topic	
The Study of Hair	
[Alignment to Standards](#)	

HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics, as well as possible social, cultural and environmental impacts.
HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Learning Objectives and Activities

Learning Objectives:

DEPARTMENT: **Science**   COURSE: **Forensic Science**

- Why is hair considered class evidence?
- What is the structure of hair?
- How are the parts of a hair used for various forensic investigations?
- Evidence is needed to determine the method by which a crime has been committed.
- Hair can be analyzed chemically and with a microscope for visual characteristics.

Learning Activities:
- Case Studies with discussion of evidence classification, processing procedures
- Microscopic Analysis of Hair: animal vs. human
- Whose Hair was at the Crime Scene? Lab
- Identify the various parts of a hair
- Describe variations in the structure of the medulla, cortex and cuticle
- Distinguish between human and nonhuman animal hair
- Determine if two examples of hair are likely to be from the same person
- Calculate the medullary index for a hair
- Distinguish hairs from individuals belonging to the broad racial categories

Assessments

Formative:
- Do Now questions:
  - When is hair considered class/individual evidence?
  - What are the parts of a hair and their functions?
  - A hair is found to be naturally colored 3 cm from the root. How long has it been since the person's hair was dyed?
- Lab analysis questions
- Hair webquest
- Whose Hair Was At the Crime Scene?
- Animal Hair Challenge

Summative:
- Hair Assessment: explain how hair can be used in a forensic investigation

Benchmark: N/A

Alternative:
- Hair Presentations: pairs present various topics on hair

Interdisciplinary Connections

ELA:

DEPARTMENT: **Science**   COURSE: **Forensic Science**

LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Each test includes short answer questions.

Mathematics:
MA.9-12.A-REI.B: Solve equations and inequalities in one variable. Students will use mathematics to calculate magnification when viewing hair samples under the microscope.

Career Readiness, Life Literacies, and Key Skills

9.4.12.CI.1: Demonstrate the ability to reflect, analyze and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

Technology Integration

Career Education

CRP-2: Apply appropriate academic and technical skills. Students use knowledge and skills through their lab work.
CRP-4: Communicate clearly and effectively and with reason. Students visually represent via google slides the various aspects of hair including its structure, how it varies so it can be used to identify someone and how it can be analyzed.
CRP-12: Work productively in teams while using cultural global competence. Students work productively in collaborative groups using culturally global competence.

Time Frame	1 Week
Topic	
A Study of Fibers and Textiles	
Alignment to Standards	
HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics, as well as possible social, cultural and environmental impacts.	
Learning Objectives and Activities	

DEPARTMENT: **Science**   COURSE: **Forensic Science**

Learning Objectives:
- Why are fibers an excellent source of trace evidence?
- How do natural fibers differ from synthetic fibers?
- How is fiber evidence gathered?
- How are fibers identified?
- Evidence is needed to determine the method by which a crime has been committed.
- Fiber evidence can be used in forensic science to create a link between crime and suspect.

Learning Activities:
- Case Studies with discussion of evidence classification, processing procedures
- Microscopic examination of fibers
- Identifying Unknown Fiber lab
- Solving a crime with fiber evidence lab
- Identify and describe sources of various textiles
- Compare and contrast various types of fibers through physical and chemical analysis
- Describe principal characteristics of common fibers used in their identification

Assessments

Formative:
- Do Now questions:
  - What kind of evidence is fiber evidence considered? Why?
  - How do natural and synthetic fibers differ?
  - How are fibers analyzed in ways that will damage them?
  - How are fibers analyzed in ways that will <u>not</u> damage them?
- Microscopic Examination of Fibers
- Identifying Unknown Fiber lab
- Fiber worksheet

Summative:
- Fiber assessment
- Apply forensic science techniques to analyze fibers

Benchmark: N/A

Alternative:
- Case Study Analysis - Tiny Fibers Helped FBI Nab Serial Killer

Interdisciplinary Connections

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ELA:
LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Each test includes short answer questions.

Mathematics:
MA.9-12.A-REI.B: Solve equations and inequalities in one variable. Students will use mathematics to calculate magnification when viewing hair samples under the microscope.

Career Readiness, Life Literacies, and Key Skills
9.4.12.CI.2: Identify career pathways that highlight personal talents, skills and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
Technology Integration
Career Education
CRP-2: Apply appropriate academic and technical skills. Students use knowledge and skills through their lab work.   **CRP-12:** Work productively in teams while using cultural global competence. Students work productively in collaborative groups using culturally global competence.

Time Frame	1 Week
Topic	
Fingerprints	
[Alignment to Standards](#)	
HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics, as well as possible social, cultural and environmental impacts.	
Learning Objectives and Activities	

Learning Objectives:
- How is fingerprint evidence used to determine whether a crime has been committed?

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- Why is the use of fingerprints an imperfect form of identification?
- Evidence is needed to determine the method by which a crime has been committed.
- Fingerprints are impressions left on a surface that consist of patterns made by the ridges on a finger and are unique to all individuals.

Learning Activities:
- Case Studies with discussion of evidence classification, processing procedures
- Fingerprint webquests - history of fingerprints and fingerprint characteristics; collecting/preserving fingerprint evidence
- Analyzing Fingerprints lab
- Solve a crime with fingerprint evidence
- Discuss the history of fingerprinting
- Describe the characteristics of fingerprints
- Identify the basic types of fingerprints
- Describe how criminals attempt to alter their fingerprints
- Determine the reliability of fingerprints as a means of identification
- Explain how fingerprint evidence is collected
- Describe the latest identification technologies
- Determine if a fingerprint matches a fingerprint on record

Assessments

Formative:
- Case Studies with discussion of evidence classification, processing procedures
- Do Now questions:
    - What are the different fingerprint characteristics?
    - How do latent, plastic, and patent fingerprints differ?
    - How are latent fingerprints collected for analysis?
- Current event articles
- Fingerprint webquests

Summative:
- Fingerprint assessment
- Identifying fingerprints activity

Benchmark: N/A

Alternative: N/A

Interdisciplinary Connections

DEPARTMENT: **Science**   COURSE: **Forensic Science**

ELA:
LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Each quiz and lab includes short answer questions.
LA.WHST.11-12.1.A: Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. Students must provide evidence to support their claims when answering lab analysis questions.

Mathematics: N/A

Career Readiness, Life Literacies, and Key Skills

Technology Integration

Career Education

CRP-2: Apply appropriate academic and technical skills. Students use knowledge and skills through their lab work.
CRP-10: Plan education and career paths aligned to personal goals. Students listen to a detective discuss the analysis of fingerprints and other evidence as well as tasks and education the job entails.
CRP-12: Work productively in teams while using cultural global competence. Students work productively in collaborative groups using culturally global competence.

Time Frame	2 Weeks
Topic	
DNA Fingerprinting	
[Alignment to Standards](#)	
HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics, as well as possible social, cultural and environmental impacts.	

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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.

Learning Objectives and Activities

Learning Objectives:
- Where does a child get his/her DNA?
- What variations in the human genome exist among individuals?
- What techniques are used in analyzing DNA evidence?
- Evidence is needed to determine the method by which a crime has been committed.
- DNA evidence is an excellent tool for identification in forensic science because no two people except identical twins have the same DNA.

Learning Activities:
- Case Studies - class discussion of evidence classification, processing procedures
- Current event articles
- Virtual Gel Electrophoresis lab
- Where's the CAT? DNA Fingerprinting Simulation lab
- DNA extraction from wheat germ lab
- DNA fingerprinting electrophoresis lab
- Describe how crime-scene evidence is collected for DNA analysis
- Explain how crime-scene evidence is processed to obtain DNA
- Describe how radioactive probes are used in DNA fingerprinting
- Describe how DNA evidence is compared for matching
- Explain how DNA fingerprinting is used to determine if specimens come from related or unrelated individuals
- Explain how to use DNA fingerprinting to identify DNA from a parent, child or relative of another person

Assessments

Formative:
- Do Now questions:
  - How does gel electrophoresis work to separate DNA fragments?
  - How is DNA evidence collected to preserve its integrity?
- Lab analysis questions
- DNA Fingerprints Unite Parent and Child Activity
- Using DNA fingerprints to Solve Crimes Activity

Summative:
- DNA Fingerprinting assessment (short answer)

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Benchmark: N/A

Alternative: N/A

Interdisciplinary Connections

ELA:
LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Each test and lab includes short answer questions.
LA.WHST.11-12.1.A: Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. Students must provide evidence to support their claims when answering lab analysis questions.

Mathematics: N/A

Career Readiness, Life Literacies, and Key Skills

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

Technology Integration

Career Education

CRP-2: Apply appropriate academic and technical skills. Students use knowledge and skills through their lab work.
CRP-12: Work productively in teams while using cultural global competence. Students work productively in collaborative groups using culturally global competence.

Time Frame	1 Week
Topic	
Handwriting Analysis, Forgery & Counterfeiting	

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Alignment to Standards

HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics, as well as possible social, cultural and environmental impacts.

Learning Objectives and Activities

Learning Objectives:
- What are the different characteristics of handwriting that experts analyze during a forensic investigation?
- What is an exemplar?
- How is handwriting analyzed?
- What is counterfeiting?
- Evidence is needed to determine the method by which a crime has been committed.
- Document analysis is the examination and comparison of questioned documents with known material.
- Counterfeiting involves the copying of false documents or other items for the purpose of deception.

Learning Activities:
- Case Studies - class discussion of evidence classification, processing procedures
- Handwriting Analysis Lab
- Microscopic Examination of U.S. Currency Security Features - testing real and "counterfeit" bills using a counterfeit-detecting pen
- Ink Chromatography lab
- Describe twelve types of handwriting exemplars that can be analyzed in a document
- Demonstrate an example of five of the twelve exemplars of handwriting traits
- Identify the major goals of a forensic handwriting analysis
- Describe some of the technology used in handwriting analysis
- Distinguish between the terms forgery and fraudulence
- Identify several ways in which businesses prevent check forgery
- Describe four features of paper currency that are used to detect counterfeit bills

Assessments

Formative:
- Do Now questions:
  - What is a questioned document?
  - How are questioned documents analyzed?
  - How does forgery differ from fraudulence?

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- Lab analysis questions
- Essay - Who killed Lindbergh's baby?

Summative:
- Handwriting Analysis, Forgery and Counterfeiting assessment

Benchmark: N/A

Alternative: N/A

Interdisciplinary Connections

ELA:
LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Each test and lab includes short answer questions.
LA.WHST.11-12.1.A: Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. Students must provide evidence to support their claims when answering lab analysis questions and writing the essay where they must provide evidence to support their theory of who murdered Lindbergh's baby.

Mathematics: N/A

Career Readiness, Life Literacies, and Key Skills

9.4.12.CI.1: Demonstrate the ability to reflect, analyze and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

Technology Integration

Career Education

CRP-2: Apply appropriate academic and technical skills. Students use knowledge and skills through their lab work.
CRP-4: Students communicate effectively to articulate their ideas on who they believe killed the Lindbergh baby using evidence presented in a documentary.
CRP-12: Work productively in teams while using cultural global competence. Students work productively in collaborative groups using culturally global competence.

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Time Frame	2 Weeks

Topic
Blood & Blood Spatter

Alignment to Standards

HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics, as well as possible social, cultural and environmental impacts.
HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
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.

Learning Objectives and Activities

Learning Objectives:
- What is the composition of blood?
- How are blood types determined?
- How are various sources of blood identified?
- How are blood-spatter patterns created?
- Evidence is needed to determine the method by which a crime has been committed.
- Blood typing can be a form of class evidence.
- Blood-spatter analysis can be used to recreate a crime scene.

Learning Activities:
- Case Studies - class discussion of evidence classification, processing procedures
- Using blood typing to solve a crime lab
- Calculating blood type probabilities
- Blood Spatter Lab
- Describe the composition of blood
- Describe the functions of blood cells
- Explain a brief history of the use of blood and blood-spatter analysis in forensics
- Describe how to determine the blood type of a sample of blood
- Describe how to screen for the presence of human blood
- Calculate the probability of certain blood types within a population
- Conduct a blood-spatter analysis
- Examine blood spatter patterns and determine the nature of the weapon

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- Use blood-spatter evidence to recreate the events at a crime scene

Assessments

Formative:
- Do Now questions:
    - What are the parts of blood and their functions?
    - How is blood evidence analyzed?
    - How can blood evidence be detected even if it has been washed away?
- Blood Basics Webquest
- Lab analysis questions
- Blood typing probability problems
- Blood vocabulary quiz

Summative:
- Blood assessment (multiple choice & short answer)
- Use blood-spatter evidence to recreate the events at a crime scene.

Benchmark: N/A

Alternative: N/A

Interdisciplinary Connections

ELA:
LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Each test and lab includes short answer questions.
LA.WHST.11-12.1.A: Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. Students must provide evidence to support their claims when answering lab analysis questions.

Mathematics:
MA.9-12.S-CP.A.2: Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities and use this characterization to determine if they are independent. Students will use mathematics to calculate the probability of an individual having a certain blood type.

Career Readiness, Life Literacies, and Key Skills

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9.4.12.CI.1: Demonstrate the ability to reflect, analyze and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

Technology Integration

Career Education
CRP-2: Apply appropriate academic and technical skills. Students use knowledge and skills through their lab work.   **CRP-12:** Work productively in teams while using cultural global competence. Students work productively in collaborative groups using culturally global competence.

Time Frame	2 Weeks

Topic
Death: Meaning, Manner, Mechanism, Cause & Time

Alignment to Standards
HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.   **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.   **HS-ESS3-5:** Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

Learning Objectives and Activities

Learning Objectives:
- What is the definition of death?
- How do the manner, cause, mechanism and time of death compare?
- What kinds of evidence are present on a dead body to lead forensic examiners to conclude the manner, cause, mechanism and time of death?
- Evidence is needed to determine the method by which a crime has been committed.
- There are several definitions of death.
- Forensic scientists must determine the manner, cause, mechanism and time of death.

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- Human deaths linked to climate change.

Learning Activities:
- Case Studies - class discussion of evidence classification, processing procedures
- Calculating time of death using rigor mortis data lab
- Calculating time of death using stomach and intestinal contents
- Forensic Entomology Lab - students use a simulation and analyze insect evidence to calculate post-mortem interval
- Discuss the definition of death
- Distinguish between four manners of death: natural, accidental, suicidal and homicidal
- Differentiate between cause, manner and mechanisms of death
- Explain how the development of rigor, algor and livor mortis occurs following death
- Use evidence of rigor, algor and livor mortis to calculate the approximate time of death
- Describe the stages of decomposition of a corpse
- Explain how time of death can be estimated using insect evidence
- Provide an example of the succession of different types of insects that are found on a body as it decomposes
- Given insect evidence, livor, rigor and algor mortis data, be able to estimate the time of death.
- Describe how various environmental factors may influence the estimated effects and time of death, i.e.climate change

Assessments

Formative:
- Do Now questions:
  - How does livor mortis differ from rigor mortis?
  - How many degrees does the body cool within the first 12 hours?
  - A corpse contains stiffness in the face and neck. How many hours has the person been dead?
  - What are the insects, listed in the order they arrive on a dead corpse?
  - What are some factors that affect rigor mortis and how do they affect it?
- Meaning, Manner, Cause & Time Death Quiz
- Calculating Time of Death Using Rigor Mortis Data Lab
- Estimating Post-Mortem Interval Lab

Summative:
- Death: Meaning, Manner, Cause & Time assessment (multiple choice & short answer)
- Use evidence from the autopsy's report on stomach contents to estimate time of death.

DEPARTMENT: **Science**   COURSE: **Forensic Science**

Benchmark: N/A

Alternative:
Presentation of specific links between climate change and human deaths and list examples of how this is determined by pathologists.

Interdisciplinary Connections

ELA:
LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Each test and lab includes short answer questions.
LA.WHST.11-12.1.A: Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. Students must provide evidence to support their claims when answering lab analysis questions.

Mathematics:
MA.9-12.N-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. Students must use math to calculate the post-mortem interval of a dead body using insect evidence.

Career Readiness, Life Literacies, and Key Skills

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

Technology Integration

Career Education

CRP-2: Apply appropriate academic and technical skills. Students use knowledge and skills through their lab work.
CRP-12: Work productively in teams while using cultural global competence. Students work productively in collaborative groups using culturally global competence.

Time Frame	1 Week

DEPARTMENT: **Science**   COURSE: **Forensic Science**

Topic
Drug Identification & Toxicology

Alignment to Standards

HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics, as well as possible social, cultural and environmental impacts.
HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Learning Objectives and Activities

Learning Objectives:
- What are toxins?
- What are the five types of controlled substances?
- What are the goals of toxicology?
- Evidence is needed to determine the method by which a crime has been committed.
- Forensic toxicology is a valuable tool in establishing the cause of death at a crime scene.

Learning Activities:
- Drug Awareness Project
- Celebrity Overdose Research Project
- Lab Activities - Drug Analysis Lab
- Identify the five types of controlled substances
- Give two examples of drugs in each of the five classes of controlled substances
- Relate signs and symptoms of overdose with a specific class of drugs or toxins
- Describe the role of various types of toxins in causing death
- Discuss agents that may be used in bioterrorism
- Define and describe the goals and practice of toxicology

Assessments

Formative:
- Do Now questions:
  - What is a drug?
  - How do poisons and toxins differ?
  - How to identify if a person is being poisoned slowly with small amounts of a toxin; is this chronic or acute poisoning?
  - What are the 5 classes of controlled substances?

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- Drug Analysis Lab
- Celebrity Overdose Research Project & Presentation
- Toxicology Quiz

Summative:
- Drug Awareness Project

Benchmark: N/A

Alternative: N/A

Interdisciplinary Connections

ELA:
LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Students must communicate effectively when presenting research regarding classes of drugs.
LA.WHST.11-12.1.A: Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. Students must provide evidence to support their claims when answering lab analysis questions.

Mathematics: N/A

Career Readiness, Life Literacies, and Key Skills

Technology Integration

9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments

Career Education

CRP-2: Apply appropriate academic and technical skills. Students use knowledge and skills through their lab work.
CRP-12: Work productively in teams while using cultural global competence.
Students work productively in collaborative groups using culturally global competence.

DEPARTMENT: **Science**   COURSE: **Forensic Science**

Time Frame	2 Weeks

Topic
Forensic Anthropology: What We Learn from Bones

Alignment to Standards

HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics, as well as possible social, cultural and environmental impacts.
HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

Learning Objectives and Activities

Learning Objectives:
- What are the characteristics of bone?
- What can bones tell us?
- What is the purpose of skeletal trauma analysis?
- Evidence is needed to determine the method by which a crime has been committed.
- The conditions of bones can provide valuable clues to forensic investigators.

Learning Activities:
- Determining the age of a skull
- Bones: male or female?
- Estimation of height from individual bones
- Medical examiner's findings - finding the cause of death in various cases using given evidence
- Forensic Anthropology Lab - determine gender, race, age and height of unidentified skeletal remains
- Explain how bone is formed
- Distinguish between male and female skeletal remains based on skull, jaw, brow ridge, pelvis and femur
- Describe how bones contain a record of injuries and disease
- Describe how a person's approximate age could be determined by examining his or her bones
- Explain the differences in facial structures among different races
- Explain the role of mitochondrial DNA in bone identification

Assessments

DEPARTMENT: **Science**   COURSE: **Forensic Science**

Formative:
- Do Now questions:
    - How do osteoblasts, osteoclasts and osteocytes differ?
    - What is the gender of a skull found with a jaw that is greater than 90 degrees, square-shaped eye sockets and a rough, bumpy surface?
    - Why are epiphysis lines important in Forensic Science?
    - How can a face be reconstructed using only the skull?
- Bones Quiz
- Forensic Anthropology Lab

Summative:
- Bones assessment (short answer)

Benchmark: N/A

Alternative: N/A

Interdisciplinary Connections

ELA:
LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Each test and lab includes short answer questions.
LA.WHST.11-12.1.A: Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. Students must provide evidence to support their claims when answering lab analysis questions.

Mathematics: N/A

Career Readiness, Life Literacies, and Key Skills

Technology Integration

Career Education

CRP-2: Apply appropriate academic and technical skills. Students use knowledge and skills

DEPARTMENT: **Science**   COURSE: **Forensic Science**

through their lab work.
CRP-12: Work productively in teams while using cultural global competence. Students work productively in collaborative groups using culturally global competence.

Time Frame	1 Week
Topic	
Casts & Impressions	
Alignment to Standards	

HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics, as well as possible social, cultural and environmental impacts.

Learning Objectives and Activities

Learning Objectives:
- What are the three types of impression evidence?
- How are shoe impressions and tire impressions collected and analyzed?
- How can track width and wheelbase data identify vehicles?
- How can dental impressions be analyzed?
- Evidence is needed to determine the method by which a crime has been committed.
- Impression evidence consisting of shoes, tires, and teeth can provide clues to what happened at a crime scene.

Learning Activities:
- Lab Activities: Foot Size & Height - students explore the relationship between foot length, shoe size, shoe length and height
- Tire Impressions and Analysis - students use tire impressions to solve a crime
- Dental Impressions Lab - students create impressions of their bite marks, match bite marks found on a victim with bite marks from a suspect using data
- Case Study - class discussion of evidence classification, processing procedures
- Differentiate between latent, patent and plastic impressions
- Explain how various types of impressions can be used as trace evidence
- Explain how track width and wheelbase information are used to identify vehicles
- Prepare dental impressions and match them with bite marks

Assessments

DEPARTMENT: **Science**   COURSE: **Forensic Science**

Formative:
- Do Now questions:
    - How do patent, latent and plastic impressions differ?
    - What is an example of when a shoe print impression would be considered class evidence/ individual evidence?
    - How is shoe print impression evidence photographed?
    - How can a vehicle's direction of travel be determined?
    - How can a suspect be identified by using bite marks?
- Shoeprint Impressions Quiz
- Shoe Size & Height Lab
- Tire Impression Lab
- Dental Impressions Lab

Summative:
- Impressions assessment (multiple choice & short answer)
- Describe how to make foot, shoe, tire and tool mark impressions

Benchmark: N/A

Alternative: N/A

Interdisciplinary Connections

ELA:
LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Each test and lab includes short answer questions.
LA.WHST.11-12.1.A: Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. Students must provide evidence to support their claims when answering lab analysis questions.

Mathematics: N/A

Career Readiness, Life Literacies, and Key Skills

Technology Integration

DEPARTMENT: **Science**   COURSE: **Forensic Science**

Career Education
CRP-2: Apply appropriate academic and technical skills. Students use knowledge and skills through their lab work.   **CRP-12:** Work productively in teams while using cultural global competence. Students work productively in collaborative groups using culturally global competence.

Time Frame	1 Week
Topic	
Ballistics	
Alignment to Standards	
HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics, as well as possible social, cultural and environmental impacts.	
Learning Objectives and Activities	

Learning Objectives:
- What types of guns are shotguns?
- What is the trajectory of a projectile?
- What kind of information can be learned from gunshot residue (GSR) examination?
- What is NIBIN and how is it used to help solve crimes?
- Evidence is needed to determine the method by which a crime has been committed.
- Ballistics is the study of bullets and firearms.
- By recovering bullets and casings at a crime scene, investigators can learn information about the crime.
- Investigators may be able to calculate a bullet's path or trajectory to find the location of the shooter.
- Forensic specialists can use gunshot residue and gunshot wounds to help them recreate a crime scene.

Learning Activities:
- Lab Activity - compare firing pin impressions from different sources
- Ballistics Lab - students examine a set of safe bullets found at a crime scene to determine if they were fired from the same gun

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- Distinguish between a bullet and a cartridge
- Describe rifling on a gun barrel and how it affects the flight of the projectile
- Explain the relationship between barrel size and caliber
- Describe how bullets are test-fired and matched
- Discuss the role of ballistics recovery and examination at a crime scene
- Determine the position of the shooter based on bullet trajectory

Assessments

Formative:
- Do Now questions:
  - How do long guns and handguns differ?
  - What are the parts of a cartridge?
  - How can rifling be used to identify the firearm used to commit a crime?
  - How can gunshot residue be used to solve a crime?
- Ballistics Lab
- Firing Pin Match Lab

Summative:
- Ballistics Assessment

Benchmark: N/A

Alternative:
- Differentiate between a handgun, a rifle and a shotgun.

Interdisciplinary Connections

ELA:
LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Each test and lab includes short answer questions.
LA.WHST.11-12.1.A: Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims and create an organization that logically sequences the claim(s), counterclaims, reasons and evidence. Students must provide evidence to support their claims when answering lab analysis questions.

Mathematics: N/A

Career Readiness, Life Literacies, and Key Skills

DEPARTMENT: **Science**   COURSE: **Forensic Science**

Technology Integration
9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).
Career Education
CRP-2: Apply appropriate academic and technical skills. Students use knowledge and skills through their lab work. **CRP-12:** Work productively in teams while using cultural global competence. Students work productively in collaborative groups using culturally global competence.

Time Frame	1 Week

Topic
Final Exam Project
[Alignment to Standards](#)
Refer To Prior Standards throughout the Course
Learning Objectives and Activities

Learning Objectives:
- What events took place during the crime?
- How is a crime scene processed?
- How is evidence collected and analyzed?
- What types of professionals and techniques are needed to process each type of evidence?
- Evidence is needed to determine the method by which a crime has been committed.
- Investigators apply specific procedures and techniques to collect trace evidence.
- All forms of evidence must be properly preserved in order to recreate as complete a picture as possible of what took place before, during and after the crime.

Learning Activities:
- Students choose a crime to research and choose the method of presenting the forensic evidence pertaining to the crime to their peers.
- Collect evidence using proper procedures.

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- Analyze evidence with proper tools and techniques to determine the details surrounding the crime.

Assessments

Formative: N/A

Summative:
- Final Project & Presentation to Class

Benchmark: N/A

Alternative: N/A

Interdisciplinary Connections

ELA:
LA.WHST.11-12.4: Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Students must communicate clearly about how forensic science was used to solve the crime they chose to research.

Mathematics: N/A

Career Readiness, Life Literacies, and Key Skills

Technology Integration

9.4.12.IML.8: Evaluate media sources for point of view, bias and motivations (e.g., NJSLSA.R6, 7.1.AL.IPRET.6).

Career Education

CRP-4: Students communicate clearly and effectively and with reason. Students present their research on the forensic evidence and analysis techniques used to solve a crime they researched.
CRP-7: Employ valid and reliable research strategies. Students must research a crime they chose and present the forensic evidence and analysis techniques used to solve a crime they researched.

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Modifications (ELL, Special Education, At Risk Students, Gifted & Talented, & 504 Plans)

ELL:
- Work toward longer passages as skills in English increase
- Use visuals
- Introduce key vocabulary before lesson
- Teacher models reading aloud daily
- Provide peer tutoring
- Use of Bilingual Dictionary
- Guided notes and/or scaffold outline for written assignments
- Provide students with English Learner leveled readers.

Supports for Students With IEPs:
- Allow extra time to complete assignments or tests
- Guided notes and/or scaffold outline for written assignments
- Work in a small group
- Allow answers to be given orally or dictated
- Use large print books, Braille, or books on CD (digital text)
- Follow all IEP modifications

At-Risk Students:
- Guided notes and/or scaffold outline for written assignments
- Introduce key vocabulary before lesson
- Work in a small group
- Lesson taught again using a differentiated approach
- Allow answers to be given orally or dictated
- Use visuals / Anchor Charts
- Leveled texts according to ability

Gifted and Talented:
- Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles)
- Provide options, alternatives and choices to differentiate and broaden the curriculum
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use center, stations, or contracts

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- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Expose students to beyond level texts.

Supports for Students With 504 Plans:
- Follow all the 504 plan modifications
- Text to speech/audio recorded selections
- Amplification system as needed
- Leveled texts according to ability
- Fine motor skill stations embedded in rotation as needed
- Modified or constrained spelling word lists
- Provide anchor charts with high frequency words and phonemic patterns