PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Forensic Science A

Grade Level: 10, 11, 12

Date of Board Approval: _____ 2023

Marking Period Course Weighting:

Forensic Science A

Major Assessments	45%
Skills Application	30%
Skills Practice	20%
Participation	5%
Total	100%

Curriculum Map

Overview:

This science course will provide academic theories and extensive lab experiences about the application of science to criminal investigation and the role of science in the criminal justice system. Semester topics include but are not limited to Introduction to Forensic Science; Testimonial Evidence; Physical Evidence and the Legal System; Materials Evidence Collection and Processing; Forensic Biology; Forensic Pathology; and Crime Scene Processing and Analysis. Students with diverse learning styles will have the opportunity to use a variety of learning methods to attain mastery of the skills and concepts necessary for success. These methodologies include direct instruction, laboratory activities and/or demonstrations, hands-on creative projects, interaction with various texts and media, collaboration with peers, guided inquiry, and written assignments. This course is designed as an introduction to criminal investigation and applied scientific knowledge to the legal system. Forensic Science B is highly recommended but is not required as a follow-up to this course.

Time/Credit for the Course: Half Year Course, meeting daily for 46 minutes / 0.5 Credits

Curriculum Writing Committee: Lindsay Duffy and Chelsea Sweeney

Curriculum Map

<u>**Goals:**</u>

1. **Marking Period One - Over a 45-day period of time, students will aim to understand:**

   UNIT 1: Introduction to Forensic Science
   UNIT 2: Testimonial Evidence
   UNIT 3: Physical Evidence

   - Define *forensic science*
   - Nature and role of forensic science
   - Value of forensic science to society
   - Historical development of forensic science
   - Nature of scientific method and application to the real world
   - Role scientific method plays in all aspects of forensic science and investigation
   - Explain how forensic science relies on multiple disciplines to solve crimes
   - List and discuss the specialized fields utilized by forensic scientists
   - Classification of Evidence
   - Utilization of Evidence
   - Locard Exchange Postulate
   - Corpus Delicti – "Body of the Crime"
   - Means, Motive, Opportunity
   - Establishing linkages & exclusions based upon evidence
   - Identification, collection, & preservation of evidence
   - Examine & analyze case studies highlighting different areas of forensic science
   - Origin of Legal Systems
   - Outline steps of the judicial process
   - 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 with what actually happened
   - Relate observation skills to their use in forensic science
   - Practice and improve observation skills
   - Compare & Contrast Eye witness testimony vs. Expert Testimony
   - Recognize how to conduct suspect photo & police line ups
   - Evaluate the importance of a code of ethics to professional organizations
   - Compare and contrast an interview and an interrogation
   - Describe the cognitive approach for interviewing
   - Discuss special considerations for interviewing children

- Differentiate between the models of interrogation
- Identify proper protocols to solicit confessions
- Evaluate case studies & identify proper procedures & protocol
- Recognition & classification of physical evidence at a scene
- Identifying Class Characteristics vs. Individual Characteristics of evidence
- Identify the different types of trace evidence such as Hair, Fibers, Glass, Paint, Soil etc.
- Establish linkages as result of "trace" evidence
- Identify and describe common weave patterns of textile samples
- Compare and contrast various types of fibers through physical and chemical analysis
- Describe principle characteristics used to identify common fibers
- Apply forensic science techniques to analyze fibers
- Describe variations in the structure of the medulla, cortex, and cuticle
- Distinguish between human and nonhuman hair
- Explain how hairs & fibers can be used in a forensic investigation
- Evaluate & analyze case studies highlighting the significance of trace evidence

2. **Marking Period Two - Over a 45-day period of time, students will aim to understand:**

   UNIT 4: Forensic Pathology
   UNIT 5: Forensic Biology
   UNIT 6: Crime Scene Processing and Analysis

   - Discuss the history of coroners and medical examiners
   - Describe the steps of a death investigation
   - Discuss how laboratory tests are used to determine the contributing factors that led to someone's death
   - Compare and contrast collection of biological and non-biological evidence during an autopsy
   - Describe the organization and structure of the autopsy report
   - Protocol for Forensic Autopsy
   - Distinguish between four manners of death: natural, accidental, suicidal, and homicidal
   - Distinguish between cause, manner, and mechanisms of death
   - Explain the development of rigor, algor, and livor mortis following death
   - Stages of Decomposition
   - Specific wound analysis

- Identify body systems and discuss their forensic implications
- Discuss how investigators study injuries to determine the extent, or degree, of injury
- Differentiate between the three types of blunt-force trauma
- Discuss the four types of sharp-force trauma
- Use evidence on stomach contents to estimate time of death
- Use insect evidence to estimate time of death
- Explain how environmental factors can affect the estimated time of death
- Discuss the life cycle of insects
- Estimate time of death using insect evidence
- Examine the effects of insects on human remains
- Identify key feature of a human skeleton to identify Race, Height, Stature, Sex, & Age
- Describe how bone is formed
- Distinguish between male and female skeletal remains
- Explain how bones contain a record of injuries and disease
- Describe how a person's approximate age could be determined
- Explain the differences in facial structures among races
- Discuss the role of mitochondrial DNA in bone identification
- Determining Age, Race, Gender, Height
- Compare and contrast permanent and deciduous human dentition
- Recognize the value of odontology in forensic investigations
- Explain how teeth and craniofacial features are helpful in estimating age, ancestry, and sex
- Differentiate between the dentition of humans and other animals
- Identify the steps involved in preserving, packaging, and processing evidence
- Recognize that protocol is important to the admissibility of evidence
- Explain the role of the first officer at the scene
- Demonstrate the steps in crime scene processing and analysis
- Recognize that documentation is important in the stages of an investigation
- Analyze written scenarios for proper protocol
- Evaluate, collect, and process material from a mock scene using appropriate skills and knowledge of preserving, packaging, and processing
- Illustrate various methods of documenting a scene
- Establish exclusions of suspects or link a suspect through proper comparison of evidence
- Construct a formal written police report

Big Ideas:

Big Idea # 1: Asking questions and defining problems is/are essential to developing a scientific habit of mind.

Big Idea # 2: Scientists construct mental and conceptual models of phenomena to represent ways of knowing that are represented and communicated by words, diagrams, charts, graphs, images, and symbols.

Big Idea # 3: Observed patterns of forms and events guide organization and classification and prompt questions about relationships and the factors that influence them.

Big Idea # 4: Cause and Effect: Causal relationships and their mechanisms can be tested and used to predict and explain events.

Big Idea #5: Data must be presented in a form that can reveal any patterns and relationships and that allows results to be communicated to others.

Big Idea #6: The way in which an object or living thing is shaped determines many of its properties and functions.

Big Idea #7: Hereditary information in genes is inherited and expressed

Big Idea #8: DNA segments contain information for production of proteins necessary for growth and reproduction of cell

Big Idea #9: Systems and system models: Scientists develop and use system models to represent current understandings, aid in developing questions and experiments, and communicate ideas to others.

Textbook and Supplementary Resources

Name of Textbook: Forensic Science: Fundamentals and Investigations 3rd ed.

Textbook ISBN#: 9780357543627

Textbook Publisher & Year of Publication: Cengage, 2021

Curriculum Plan

<u>**Unit 1:**</u> Introduction to Forensic Science <u>**Time Range in Days:**</u> Approximately 15 days

Standard(s): PA Academic Standards, PACCS Reading and Writing for Science and Technology

Standards Addressed:

PA Academic Standards: 3.1.12.A5.; 3.1.12.A8.; 3.1.12.A9.; 3.4.12.A2; 3.4.12.A3; 3.4.12.B1

2025 Standards: 3.1.9-12.A , 3.1.9-12.B, 3.1.9-12.C, 3.1.9-12.Q , 3.1.9-12.R, 3.1.9-12.S, 3.1.9-12.X

PACCS: CC.3.5.11-12.B.; CC.3.5.11-12.E.; CC.3.6.11-12.C.; CC.3.6.11-12.D.; CC.3.6.11-12.E.; CC.3.6.11-12.G.

Anchor(s): S11.A.1; S11.B.1; S11.A.1.2; S11.A.1.3; S11.A.2.1; S11.A.3.1; S11.A.3.2; S11.A.3.3; S11.B.3.2

<u>**Eligible Content:**</u>
- Analyze and explain the accuracy of scientific facts, principles, theories, and laws.
- Explain how specific scientific knowledge or technological design concepts solve practical problems.
- Analyze or compare the use of both direct and indirect observation as means to study the world and the universe.
- Explain and apply scientific concepts to societal issues using case studies.
- Use case studies to propose possible solutions and analyze economic and environmental implications of solutions for real world problems.
- Critique the elements of an experimental design (e.g., raising questions, formulating hypotheses, developing procedures, identifying variables, manipulating variables, interpreting data, and drawing conclusions) applicable to a specific experimental design.
- Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
- Communicate results of investigations using multiple representations.
- Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations.
- Explain how technology is used to extend human abilities and precision.

Objectives: (Students will be able to)

1. State the goals of science (DOK 1)
2. Recall the steps of the scientific method (DOK 1)

3. Conduct and analyze one or more scientific investigations (DOK 2 and DOK 4)
4. Explain how scientific attitudes generate new ideas (DOK 3)
5. Assess the importance of peer review (DOK 3)
6. Explain what a scientific theory is (DOK 3)
7. Connect the relationship between science and society (DOK 4)
8. Recall what disciplines play a pivotal role in forensic investigations (DOK 1)
9. Observe and evaluate scenarios using inductive and deductive reasoning skills (DOK 2)
10. Draw conclusions about the use of forensic science in the judicial system (DOK 3)

Core Activities and Corresponding Instructional Methods: ***Due to ongoing current events, cases, technology, and topics in the course, flexibility is needed by the instructor in the presentation of materials and content of this course.*

1. Introduce the history and value of the application of science to criminal investigations.

- Students can evaluate historical examples of scientific experiments and recall the steps of the scientific method. In doing so, students will gain a deeper understanding of what science is and how certain scientific investigations have helped pave the way for current thinking in science and society. In doing so, students will gain a deeper understanding of what science is and how certain scientific investigations have helped pave the way for current thinking in science and society.
- Students can participate in and complete a group inquiry and logic problem activity to promote the development of communication and critical thinking skills needed throughout the course.
- Students can work in cooperative learning groups at designated lab stations with partners to complete an observation, deductive and inductive reasoning analysis lab to simulate the cooperative learning environment of the different sections of the FBI crime lab. This will also serve as structured practice for students to use intrapersonal, observational, communication, and reasoning skills.

2. Investigate the different scientific disciplines involved in the areas of criminalistics and forensic science.

- Introduction to historical figures that developed multiple forensic science disciplines through direct instruction of teacher generated PowerPoint or Smart Notebook software.
- Students can conduct an independent investigation using computer-based skills on a forensic science discipline through media, text, or other resources regarding careers available in that related field and current or previous cases highlighting that specific discipline and prepare a multimedia presentation to share knowledge of the discipline studied.

3. Evaluate and analyze forensic science case studies that highlight the different disciplines of forensic science.

- Students may participate in group jigsaw activities assigned to analyzing different areas of case study.
- Students may answer analysis and discussion questions regarding case to answer content questions and drive whole class discussion.
- Students can write summary paragraphs, or create materials for debate, discussion, or multimedia presentation.

Assessments:

Diagnostic:

- Informal Questioning
- Teacher Observation
- Class Discussion
- At-the-Bell Questions

Formative:

- Informal Questioning
- Teacher Observation
- Class Discussion
- At-the-Bell Questions
- Assorted worksheets
- Teacher-generated assignments
- Laboratory Exercises
- Vocabulary practice
- Diagrams if applicable
- Concept Maps
- Study guides
- Video guides
- Case Study Analysis
- Current case logs/journals
- Structured class discussion
- Activities and Review Games

Summative:
- Career Study project
- History and Value of Forensic Science Unit Quizzes
- Common Assessment: History and Value of Forensic Science Unit Exam

Unit 2: Testimonial Evidence   **Time Range in Days:** Approximately 15 days

Standard(s): PA Academic Standards, PACCS Reading and Writing for Science and Technology

Standards Addressed:
PA Academic Standards: 3.1.12.A5.; 3.1.12.A8.; 3.1.12.A9.; 3.4.12.A2; 3.4.12.A3; 3.4.12.B1.

2025 Standards: 3.1.9-12.A , 3.1.9-12.B, 3.1.9-12.C, 3.1.9-12.Q , 3.1.9-12.R, 3.1.9-12.S, 3.1.9-12.X

PACCS: CC.3.5.11-12.B.; CC.3.5.11-12.E.; CC.3.6.11-12.C.; CC.3.6.11-12.D.; CC.3.6.11-12.E.; CC.3.6.11-12.G.

Anchor(s): S11.A.1; S11.B.1; S11.A.1.2; S11.A.1.3; S11.A.2.1; S11.A.3.1; S11.A.3.2; S11.A.3.3; S11.B.3.2

Eligible Content:
- Analyze and explain the accuracy of scientific facts, principles, theories, and laws.
- Explain how specific scientific knowledge or technological design concepts solve practical problems.
- Analyze or compare the use of both direct and indirect observation as means to study the world and the universe.
- Explain and apply scientific concepts to societal issues using case studies.
- Use case studies to propose possible solutions and analyze economic and environmental implications of solutions for real world problems.
- Critique the elements of an experimental design (e.g., raising questions, formulating hypotheses, developing procedures, identifying variables, manipulating variables, interpreting data, and drawing conclusions) applicable to a specific experimental design.
- Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
- Communicate results of investigations using multiple representations.
- Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations.
- Explain how technology is used to extend human abilities and precision.

Objectives:

(Students will be able to)
1. Identify the difference between probative and associative value when it comes to evidence (DOK 1)
2. Discuss the importance of significant cases that have impacted forensic science (DOK 2)

3. Interpret the steps of the judicial process from identification of a suspect through the trial (DOK 2)
4. Classify evidence as to whether it is physical or testimonial (DOK 2)
5. Differentiate between an inference and an observation and describe what changes occur in the brain while making observations (DOK 3)
6. State examples of factors influencing eyewitness accounts of events (DOK 1)
7. Draw conclusions on the reliability of eyewitness testimony with what happened during the event (DOK 3)
8. Relate observation skills to their use in forensic science (DOK 2)
9. Compare and contrast an interview and an interrogation (DOK 3)
10. Describe the cognitive approach for interviewing (DOK 1)
11. Design special considerations for interviewing children (DOK 4)
12. Differentiate between the five common models of interrogation (DOK 3)
13. Analyze, evaluate, and draw conclusions about a simulated crime scene(s) (DOK 3 and DOK 4)

Core Activities and Corresponding Instructional Methods: _ Due to ongoing current events, cases, technology, and topics in the course, flexibility is needed by the instructor in the presentation of materials and content of this course._**

1. **Introduce the different categories of evidence.**
   - Students can establish connections from introductory material to being introduced to new concepts on evidence through direct instruction and graphic organizers outlining the different types of evidence.
2. **Evaluate the validity of physical vs. testimonial evidence and evidence admissibility.**
   - Students can outline key concepts of significant court cases from teacher selected readings and the readings in the textbook to evaluate examples of rulings determining the admissibility of evidence in the courtroom Students can participate in round table group discussions to evaluate comprehension of evidence admissibility using different court cases such as _Coppolino v. State_, and the "Nature of Evidence Reading" and associated prompted discussion questions. In doing so, students will gain a deeper understanding of the impact of advancements in science and technology and how they impact society and pending court cases and how evaluation of evidence plays a critical role in crime scene investigation.
3. **Introduce and model how to conduct police interviews to collect testimonial evidence.**
   - Students can work as collaborative pairs in an observation and memory activity for interpretation of an eyewitness account. By observing a mock crime scene scenario/video/or slideshow presenting an event, students

will work as an instigative team working on their observation and communication skills during this collaborative activity.

- Students can conduct and interview and participate in the construction of a police sketch artist composite sketch of a suspect using information from an eyewitness using independent computer skills to work with the FACES software computer program to generate the suspect sketch.

4. **Introduce and provide examples of the different interrogation models.**
   - Students can participate in a jigsaw ethics activity regarding ethical practices of law enforcement officials interviewing/interrogating witnesses and suspects. Students can evaluate ethical practices through teacher constructed scenarios to determine if proper protocol was followed to obtain legal information or a confession from a suspect.
   - Students can conduct a mock interview of potential eyewitnesses posing appropriate questions and presenting a photo lineup of suspects. Through the teacher selected scripted scenarios, students can transition the interview into a mock police interrogation of a suspect.
   - Students can research or read case studies to answer content questions, write summary paragraphs, or create materials for debate, discussion, or presentation. Examples of case studies include: "The Innocence Project," "Ronald Cotton Case", "Michael Crowe", and "The Detroit 5."

Assessments:

Diagnostic:
- Informal Questioning
- Teacher Observation
- Class Discussion
- At-the-Bell Questions

Formative:
- Informal Questioning
- Teacher Observation
- Class Discussion
- At-the-Bell Questions
- Assorted worksheets
- Teacher-generated assignments
- Laboratory Exercises
- Vocabulary practice
- Diagrams if applicable
- Concept Maps
- Study guides
- Video guides
- Case Study Analysis
- Current case logs/journals

- Structured class discussion
- Activities and Review Games

Summative:
- The Innocence Project Evidence Analysis project
- Evidence and the Legal System: Testimonial Evidence Unit Quizzes
- Evidence and the Legal System: Testimonial Evidence Unit Common Assessment

Unit 3: Physical Evidence   **Time Range in Days:** 15 days

Standard(s): PA Academic Standards, PACCS Reading and Writing for Science and Technology

Standards Addressed:
PA Academic Standards: 3.1.12.A5.; 3.1.12.A8.; 3.1.12.A9.; 3.4.12.A2; 3.4.12.A3; 3.4.12.B1.

2025 Standards: 3.1.9-12.A , 3.1.9-12.B, 3.1.9-12.C, 3.1.9-12.Q , 3.1.9-12.R, 3.1.9-12.S, 3.1.9-12.X

PACCS: CC.3.5.11-12.B.; CC.3.5.11-12.E.; CC.3.6.11-12.C.; CC.3.6.11-12.D.; CC.3.6.11-12.E.; CC.3.6.11-12.G.

Biology Keystone Anchors:
BIO.A.4.2.1, BIO.A.4.1.1, BIO.A.4.1.2, BIO.A.1.2.2

Anchor(s): S11.A.1; S11.B.1; S11.A.1.2; S11.A.1.3; S11.A.2.1; S11.A.3.1; S11.A.3.2; S11.A.3.3; S11.B.3.2

Eligible Content:
- Analyze and explain the accuracy of scientific facts, principles, theories, and laws.
- Explain how specific scientific knowledge or technological design concepts solve practical problems.
- Analyze or compare the use of both direct and indirect observation as means to study the world and the universe.
- Explain and apply scientific concepts to societal issues using case studies.
- Use case studies to propose possible solutions and analyze economic and environmental implications of solutions for real world problems.
- Critique the elements of an experimental design (e.g., raising questions, formulating hypotheses, developing procedures, identifying variables, manipulating variables, interpreting data, and drawing conclusions) applicable to a specific experimental design.
- Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
- Communicate results of investigations using multiple representations.
- Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations.
- Explain how technology is used to extend human abilities and precision.

Objectives: (Students will be able to)

1. Identify the type of professionals who are present at a crime scene (DOK 1)

2. Describe how evidence from a crime scene is analyzed (DOK 2)
3. Demonstrate proper techniques for collection and packaging of physical evidence (DOK 2)
4. Differentiate between class and individual characteristics of evidence (DOK 3)
5. Recognize examples of trace evidence (DOK 1)
6. Distinguish between direct and circumstantial evidence (DOK 2)
7. Classify and organize evidence to help infer what they believed to have happened in a mock crime scenario (DOK 2)
8. Evaluate and draw conclusions about a simulated crime scene(s) by applying concepts on collection and preservation of evidence learned in the classroom (DOK 3 and DOK 4)
9. Recall the unique physical properties of each type of trace evidence discussed and used during investigations (DOK 1)
10. Formulate a hypothesis and infer what they believe the source of the evidence to be (DOK 2 and DOK 3)
11. Analyze, evaluate and draw conclusions about various types of evidence (hair, sand, soil, fibers, and glass) (DOK 3 and DOK 4)

Core Activities and Corresponding Instructional Methods: ***Due to ongoing current events, cases, technology, and topics in the course, flexibility is needed by the instructor in the presentation of materials and content of this course.*

1. **Recognize and understand why following protocol is important to the admissibility of evidence.**
   ● Students can use graphic organizers and concept maps to organize major concepts of the content being presented. Students can establish connections from previous unit on testimonial evidence while being introduced to new concepts on the identification, collection, and analysis of physical evidence.
   ● Students can provide written responses to daily at the bell prompted discussion questions. For example: "Why is proper collection, packaging, and preservation of evidence essential to analysis and evaluation?" or "How can trace amounts of evidence play a vital role in linking a person with another person, place, or object?
   ● Students can use graphic organizers to outline key concepts of significant court cases from the readings in the text or teacher selected readings to evaluate examples of supreme court rulings determining the admissibility of evidence in the courtroom. In doing so, students will gain a deeper understanding of the impact of advancements in science and technology and how they impact society and pending court cases. *For example: Frye vs United States and Daubert vs Dow.*

2. **Differentiate between individual and class characteristics for all types of trace evidence analyzed.**
   - Students can participate in and complete an activity identifying pieces of evidence to classify them as having either class or individualized characteristics of evidence. This activity continues to promote the development of communication and critical thinking skills needed throughout the duration of this course.
3. **Distinguish between animal and human hair as well as between synthetic and natural fibers.**
   - Students can work at designated lab stations with partners to complete a lab analysis activity to identify different morphological characteristics of several different types of hair samples. Hair samples include: Animal, Human Hair, Human facial, underarm, and pubic hair. Students will then analyze unknown samples collected from a crime scene in a "who dunnit" activity. Example activity: "Who assaulted Mrs. Winston." These activities are used to simulate the cooperative learning environment of the different sections of a working crime lab. This will also serve as structured practice for students to use observational, communication, and reasoning skills.
   - Students can work at designated lab stations with partners to complete a fiber analysis activity to identify different physical and chemical characteristics of several different types of fiber samples. Fiber samples include: plant, animal, stem, mineral, and synthetic fibers. Students will then analyze unknown samples collected from a crime scene for comparison and identification activity. These activities are used to simulate the cooperative learning environment of the different sections of a working crime lab. This will also serve as structured practice for students to use observational, communication, and reasoning skills.
4. **Employ deductive and inductive reasoning to analyze trace evidence from several crime scenes in order to determine the source of the evidence.**
   - Students can work at lab stations with partners to complete a lab analysis of other trace evidence materials such as soil, glass, paint, and sand. In this activity, students will work to identify different components of evidence like calculating density and refractive index of the glass samples. These activities are used to simulate the cooperative learning environment of the different sections of a working crime lab. This will also serve as structured practice for students to use observational, communication, and reasoning skills.
   - Students can participate in a round table group discussion, case summary, and deep analysis of teacher-selected case studies to evaluate the use of forensic collection and analysis of physical evidence using

prompted discussion questions or reading analysis questions. Examples of case studies include: "Green Beret Murders" aka Richard McDonald Case, "The Nebraska Boy Snatcher" aka John Joubert case and "The Atlanta Child Murders" aka Wayne Williams case.

Assessments:

Diagnostic:
- Informal Questioning
- Teacher Observation
- Class Discussion
- At-the-Bell Questions

Formative:
- Informal Questioning
- Teacher Observation
- Class Discussion
- At-the-Bell Questions
- Assorted worksheets
- Teacher-generated assignments
- Laboratory Exercises
- Vocabulary practice
- Diagrams if applicable
- Concept Maps
- Study guides
- Video guides
- Case Study Analysis
- Current case logs/journals
- Structured class discussion
- Activities and Review Games

Summative:
- The Atlanta Child Murders Analysis project
- Evidence and the Legal System: Evidence Collection and Processing Unit Quizzes
- Evidence and the Legal System: Evidence Collection and Processing Unit Common Assessment

Unit 4: Forensic Pathology   **Time Range in Days:** 15 Days

Standard(s): PA Academic Standards, PACCS Reading and Writing for Science and Technology

Standards Addressed:
PA Academic Standards: 3.1.12.A5.; 3.1.12.A8.; 3.1.12.A9.; 3.4.12.A2; 3.4.12.A3; 3.4.12.B1.

2025 Standards: 3.1.9-12.A , 3.1.9-12.B, 3.1.9-12.C, 3.1.9-12.Q , 3.1.9-12.R, 3.1.9-12.S, 3.1.9-12.X

PACCS: CC.3.5.11-12.B.; CC.3.5.11-12.E.; CC.3.6.11-12.C.; CC.3.6.11-12.D.; CC.3.6.11-12.E.; CC.3.6.11-12.G.

Biology Keystone Anchors:
BIO.A.4.2.1, BIO.A.4.1.1, BIO.A.4.1.2, BIO.A.1.2.2

Anchor(s): S11.A.1; S11.B.1; S11.A.1.2; S11.A.1.3; S11.A.2.1; S11.A.3.1; S11.A.3.2; S11.A.3.3; S11.B.3.2

Eligible Content:
- Analyze and explain the accuracy of scientific facts, principles, theories, and laws.
- Explain how specific scientific knowledge or technological design concepts solve practical problems.
- Analyze or compare the use of both direct and indirect observation as means to study the world and the universe.
- Explain and apply scientific concepts to societal issues using case studies.
- Use case studies to propose possible solutions and analyze economic and environmental implications of solutions for real world problems.
- Critique the elements of an experimental design (e.g., raising questions, formulating hypotheses, developing procedures, identifying variables, manipulating variables, interpreting data, and drawing conclusions) applicable to a specific experimental design.
- Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
- Communicate results of investigations using multiple representations.
- Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations.
- Explain how technology is used to extend human abilities and precision.

Objectives:
(Students will be able to)

1. Identify and label anatomical terminology (DOK 1)
2. Apply anatomical terms to victim in criminal investigation (DOK 4)
3. Identify specific body systems and differentiate the evidence each provides (DOK 1, DOK 3)
4. State the role of a medical examiner and/or coroner in a forensic investigation (DOK 1)
5. Analyze an autopsy report (DOK 4)
6. Identify manner, cause, time, and mechanism of death (DOK 1)
7. Differentiate between manner, cause, and mechanism of death (DOK 3)
8. Summarize evidence in the autopsy report to identify cause, manner, mechanism, and time of death (DOK 2)
9. Differentiate the four manners of death (DOK 3)
10. Identify the stages of decomposition (DOK 1)
11. Estimate time of death using body systems (DOK 2)
12. Summarize how an autopsy is completed (DOK 2)

Core Activities and Corresponding Instructional Methods: ***Due to ongoing current events, cases, technology, and topics in the course, flexibility is needed by the instructor in the presentation of materials and content of this course.***

1. **Present differences between a medical examiner and coroner in order for students to understand the role of each and how they can supply information that can benefit a criminal investigation.**
   - Students can take notes via PowerPoint presentation or Smart Notebook software and use graphic organizers and concept maps to organize major concepts of the content being presented. Students establish connections from introductory material to being introduced to new concepts on how to collect biological evidence from a crime scene.
   - Students can construct written responses to daily at the bell prompted discussion questions. For example: **"**What is the difference between a medical examiner and coroner?" "What type of evidence can body systems supply to help determine time of death?"
   - Students research the qualifications to become a medical examiner/ coroner in different states, create a summary, and participate in discussion presenting their findings.
   - Students can use graphic organizers or concept maps to outline key concepts of significant court cases from the readings in the textbook or from teacher-selected readings in order to understand the role of a medical examiner and autopsy report within an investigation.

2. **Present anatomical and directional terms and describe specific systems in the body and how they function properly and how these terms can connect to a forensic science investigation and autopsy report.**
   - Students can label and color anatomy terms and planes to practice to be able to apply terminology to forensic reports.
   - Students can analyze injury reports in order to identify the body areas affected and how that information can be applied to forensic death investigation.
3. **Present and outline the organization, structure, and protocol of a forensic autopsy and the subsequent report detailing its findings**.
   - Students can complete an online virtual autopsy. They can explain how an autopsy is completed on activity analysis questions or outlined on a worksheet supplied by the teacher.
   - Students can read and analyze case studies to answer content questions, write summary paragraphs, or create materials for debate, discussion, or presentation. Examples would be "What exactly do they do during an autopsy" or "How can materials collected from an autopsy help identify a possible suspect?"
4. **Provide examples to distinguish between cause, manner, and mechanisms of death within an investigation.**
   - Students can evaluate manner, cause, time, and mechanism of death in specific scenarios to determine each. The teacher will supply practice worksheets with varying scenarios.
   - Students can complete "celebrity autopsy" activities. The teacher will supply specific celebrities that students will research and determine time, cause, means, manner, and mechanism of death from research and autopsy reports.
   - Students can read and analyze autopsy reports in order to summarize manner, cause, time, and mechanism of death.

Assessments:
Diagnostic:
- Informal Questioning
- Teacher Observation
- Class Discussion
- At-the-Bell Questions

Formative:
- Informal Questioning
- Teacher Observation
- Class Discussion
- At-the-Bell Questions

- Assorted worksheets
- Teacher-generated assignments
- Laboratory Exercises
- Vocabulary practice
- Diagrams if applicable
- Concept Maps
- Study guides
- Video guides
- Case Study Analysis
- Current case logs/journals
- Structured class discussion
- Activities and Review Games

Summative:
- Medical Examiner and Coroner Qualification Summary
- Forensic Pathology: Anatomy Quiz
- Forensic Pathology: Qualifications of Death Quiz
- Forensic Pathology: Autopsy Quiz
- Forensic Pathology: Unit Common Assessment

Unit 5:   Forensic Biology   **Time Range in Days: 15 Days**

Standard(s): PA Academic Standards, PACCS Reading and Writing for Science and Technology

Standards Addressed:
PA Academic Standards: 3.1.12.A5.; 3.1.12.A8.; 3.1.12.A9.; 3.4.12.A2; 3.4.12.A3; 3.4.12.B1.

2025 Standards: 3.1.9-12.A , 3.1.9-12.B, 3.1.9-12.C, 3.1.9-12.Q , 3.1.9-12.R, 3.1.9-12.S, 3.1.9-12.X

PACCS: CC.3.5.11-12.B.; CC.3.5.11-12.E.; CC.3.6.11-12.C.; CC.3.6.11-12.D.; CC.3.6.11-12.E.; CC.3.6.11-12.G.

Biology Keystone Anchors: BIO.A.4.2.1, BIO.A.1.2.2

Anchor(s): S11.A.1; S11.B.1; S11.A.1.2; S11.A.1.3; S11.A.2.1; S11.A.3.1; S11.A.3.2; S11.A.3.3; S11.B.3.2

Eligible Content:
- Analyze and explain the accuracy of scientific facts, principles, theories, and laws.
- Explain how specific scientific knowledge or technological design concepts solve practical problems.
- Analyze or compare the use of both direct and indirect observation as means to study the world and the universe.
- Explain and apply scientific concepts to societal issues using case studies.
- Use case studies to propose possible solutions and analyze economic and environmental implications of solutions for real world problems.
- Critique the elements of an experimental design (e.g., raising questions, formulating hypotheses, developing procedures, identifying variables, manipulating variables, interpreting data, and drawing conclusions) applicable to a specific experimental design.
- Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
- Communicate results of investigations using multiple representations.
- Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations.
- Explain how technology is used to extend human abilities and precision.

Objectives: (Students will be able to)
1. Identify and label human bones (DOK 1)
2. Apply anatomical terms to victim in criminal investigation (DOK 4)

3. Identify long bones and calculate height (DOK 1)
4. Analyze sutures on long bones to determine age (DOK 4)
5. Identify the pelvis and classify gender (DOK 1, DOK 2)
6. Identify the cranium and sutures (DOK 1)
7. Summarize age of victim from frontal and occipital sutures on the cranium (DOK 2)
8. Compare male and female characteristics of the pelvis and skull (DOK 3)
9. Estimate age, height, gender, and race from bones supplied of unknown victim (DOK 2)
10. Estimate age of victim by analyzing teeth structure (DOK 2)
11. Analyze insects on victim to determine time of death (DOK 4)

Core Activities and Corresponding Instructional Methods: ***Due to ongoing current events, cases, technology, and topics in the course, flexibility is needed by the instructor in the presentation of materials and content of this course.*

1. **Present the different areas of forensic biology, specializing in forensic anthropology and explain how the recovery of skeletal remains can aid in a forensic investigation.**
   - Through direct instruction students can take notes via PowerPoint presentation or Smart Notebook software and use graphic organizers and concept maps to organize major concepts of the content being presented. Students can establish connections from the forensic pathology unit to determine how skeletal remains can be used in forensic investigations.
   - Students can construct a written response to daily at the bell prompted discussion questions. For example: "What are the differences between a male and female pelvis?" "What type of evidence can specific insects supply when present on the body?"
   - Students will use a graphic organizer to outline key concepts of significant court cases from the readings in the textbook or from teacher-selected readings like "The Body Farm" & "Caylee Anthony" case study to determine how forensic anthropology is useful in a forensic investigation.

2. **Using direct instruction, demonstrate how certain bony structures can help to identify the relative stature, height, race, sex, or age of the victim/person.**
   - Students can complete "No bones about it" activity to practice calculating heights of unknown victim's long bones. Students can

construct skeletal remains, measure the long bones, and determine each unknown victim based on data calculated through the lab.
- Students can label and color bones in the human body on teacher generated worksheets.
- Students can evaluate diagrams of bones to determine age, height, race, and gender when applicable. Diagrams should vary in age, gender, and race to give students various practices.
- Students can analyze bone structures including the femur, humorous, cranium, and a variation of different pelvis and determine age, height, race, and gender when applicable.

3. **Identify the cranium and evaluate structures that determine age and gender through forensic odontology (the study of teeth).**
   - Students can analyze teeth and/or dental impressions in diagrams, pictures, and bone structure to determine age.
   - Students can label structures and bones that are helpful to determine aspects about the identities of victims on teacher generated worksheets.

4. **Present the life cycle of the Blow Fly to illustrate how Forensic Entomology is a key subdivision of forensic biology and can aid in forensic investigations.**
   - Students will evaluate victim condition and insects in diagrams and scenarios to determine time of death.
   - Students will read case studies to answer content questions, write summary paragraphs, or create materials for debate, discussion, or presentation. Examples include "John Wayne Gacy: The Killer Clown".
   - Students will complete note sheets, worksheets, vocabulary evaluations, and content evaluations to demonstrate understanding of the concepts within the unit.

Assessments:
Diagnostic:
- Informal Questioning
- Teacher Observation
- Class Discussion
- At-the-Bell Questions

Formative:
- Informal Questioning
- Teacher Observation

- Class Discussion
- At-the-Bell Questions
- Assorted worksheets
- Teacher-generated assignments
- Laboratory Exercises
- Vocabulary practice
- Diagrams if applicable
- Concept Maps
- Study guides
- Video guides
- Case Study Analysis
- Current case logs/journals
- Structured class discussion
- Activities and Review Games

Summative:
- Bone Anatomy and Classification Quiz
- Forensic Anthropology Unit Common Assessment and Practical

Unit 6: Crime Scene Analysis and Reconstruction   **Time Range in Days:** 15 Days

Standard(s): PA Academic Standards, PACCS Reading and Writing for Science and Technology

Standards Addressed:
PA Academic Standards: 3.1.12.A5.; 3.1.12.A8.; 3.1.12.A9.; 3.4.12.A2; 3.4.12.A3; 3.4.12.B1.

2025 Standards: 3.1.9-12.A , 3.1.9-12.B, 3.1.9-12.C, 3.1.9-12.Q , 3.1.9-12.R, 3.1.9-12.S, 3.1.9-12.X

PACCS: CC.3.5.11-12.B.; CC.3.5.11-12.E.; CC.3.6.11-12.C.; CC.3.6.11-12.D.; CC.3.6.11-12.E.; CC.3.6.11-12.G.

Anchor(s): S11.A.1; S11.B.1; S11.A.1.2; S11.A.1.3; S11.A.2.1; S11.A.3.1; S11.A.3.2; S11.A.3.3; S11.B.3.2

Eligible Content:
- Analyze and explain the accuracy of scientific facts, principles, theories, and laws.
- Explain how specific scientific knowledge or technological design concepts solve practical problems.
- Analyze or compare the use of both direct and indirect observation as means to study the world and the universe.
- Explain and apply scientific concepts to societal issues using case studies.
- Use case studies to propose possible solutions and analyze economic and environmental implications of solutions for real world problems.
- Critique the elements of an experimental design (e.g., raising questions, formulating hypotheses, developing procedures, identifying variables, manipulating variables, interpreting data, and drawing conclusions) applicable to a specific experimental design.
- Use data to make inferences and predictions, or to draw conclusions, demonstrating understanding of experimental limits.
- Communicate results of investigations using multiple representations.
- Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations.
- Explain how technology is used to extend human abilities and precision.

Objectives: (Students will be able to)
1. Identify proper crime scene protocol (DOK 1)
2. Make observations while processing witness statements, evidence, autopsy reports, and crime scene (DOK 2)
3. Compare the roles of the lead investigator, criminal photographer, sketch artist, and evidence technician in a criminal investigation (DOK 2)

4. Classify the three different types of documentation during a crime scene investigation (DOK 2)
5. Identify how to correctly package and preserve evidence (DOK 1)
6. Recognize that if evidence is not properly collected it will be admissible (DOK 1)
7. Identify the four different sketch patterns (DOK 1)
8. List important details that should be included within a sketch (DOK 1)
9. Identify how to correctly take photos (DOK 1)
10. Distinguish between the different crime scene logs and identify which each is used for (DOK 2, DOK 1)
11. Illustrate how to identify and evaluate evidence (DOK 1)
12. Hypothesize events that occurred in a crime scene investigation (DOK 3)
13. Summarize events that occurred throughout mock crime scene (DOK 2)
14. Draw conclusions based on documentation and analysis of evidence (DOK 3, DOK 4)
15. Apply concepts of crime scene protocol to mock crime scene (DOK 4)

Core Activities and Corresponding Instructional Methods: **Due to ongoing current events, cases, technology, and topics in the course, flexibility is needed by the instructor in the presentation of materials and content of this course.*

1. **Through direct instruction identify the steps involved in preserving, packaging, and processing evidence.**
   - Students can take notes via PowerPoint presentation or Smart Notebook software and use graphic organizers and concept maps to organize major concepts of the content being presented. Students establish connections from introductory units to being introduced to concepts on evidence collection, preservation, and analysis.
   - Students can construct written responses to daily at the bell prompted discussion questions. For example: "What are the specific steps that should be taken when arriving at a crime scene?" "What is the chain of custody?"
   - Students can use graphic organizers or concept maps to outline key concepts of significant court cases from the textbook or teacher-selected readings to understand how to properly collect evidence and evaluate a crime scene.

2. **Demonstrate and explain why proper documentation is important in the stages of an investigation.**
   - Students can evaluate an evidence log, chain of custody log, and photography log to identify the differences and the roles each has in a

crime scene investigation. Students can practice sketching a small crime scene. A practice sketch should be done before the final.

3. **Illustrate and explain how pieces of evidence are analyzed, interpreted, and communicated within a crime scene investigation.**
   - Students will independently answer analysis questions on proper protocol of a criminal investigation that will be discussed in class.
   - Students will read articles on what not to do during a forensics crime scene investigation to prove the importance of packaging evidence correctly. Examples include "OJ Simpson Case Taught Police What Not To Do During a Crime Scene".

4. **Model how to assess a crime scene for safety protocol & construct a police report.**
   - Students can be placed into heterogenous learning groups and students will become a crime scene investigative team. Each student will have a role/job they are responsible for. Students will evaluate a mock crime scene using proper crime scene protocol to determine the events leading up to the crime and finding the suspect.
   - Students will complete note sheets, worksheets, and content evaluations to demonstrate understanding of the concepts within the unit through a constructed police report and presentation of their findings.

Assessments:
Diagnostic:
   - Informal Questioning
   - Teacher Observation
   - Class Discussion
   - At-the-Bell Questions

Formative:
   - Informal Questioning
   - Teacher Observation
   - Class Discussion
   - At-the-Bell Questions
   - Assorted worksheets
   - Teacher-generated assignments
   - Laboratory Exercises
   - Vocabulary practice
   - Diagrams if applicable
   - Concept Maps
   - Study guides
   - Video guides
   - Case Study Analysis

- Current case logs/journals
- Structured class discussion
- Activities and Review Games

Summative:
- Crime Scene Analysis Quiz
- Mock Crime Scene Final