Pascack Valley Regional High School District

Pascack Hills High School, Montvale, New Jersey
Pascack Valley High School, Hillsdale, New Jersey

Course Name: Forensic Science

Born On: August, 2017
Revised On: August, 2020
Revised On: August, 2022
Current Revision: August 2023
Board Approval: 8/28/2023

New Jersey Curricular Mandates for Science Instruction

Disabled & LGBT:
18A:35-4.35 - History of disabled and LGBT persons included in middle and high school curriculum. A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards.

Diversity, Equity, and Inclusion (DEI):
C.18A:35-4.36a - Curriculum to include instruction on diversity and inclusion. 1. a. Beginning in the 2021-2022 school year, each school district shall incorporate instruction on diversity and inclusion in an appropriate place in the curriculum of students in grades kindergarten through 12 as part of the district's implementation of the New Jersey Student Learning Standards. b. The instruction shall: (1) highlight and promote diversity, including economic diversity, equity, inclusion, tolerance, and belonging in connection with gender and sexual orientation, race and ethnicity, disabilities, and religious tolerance; (2) examine the impact that unconscious bias and economic disparities have at both an individual level and on society as a whole; and (3) encourage safe, welcoming, and inclusive environments for all students regardless of race or ethnicity, sexual and gender identities, mental and physical disabilities, and religious beliefs. c. The Commissioner of Education shall provide school districts with sample learning activities and resources designed to promote diversity and inclusion.

Amistad Law:
N.J.S.A. 18A 52:16A-88 Every board of education shall incorporate the information regarding the contributions of African Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.

Climate Change:
2020 NJSLS-Science: Earth's climate is now changing faster than at any point in the history of modern civilization, primarily as a result of human activities. Global climate change has already resulted in a wide range of impacts across New Jersey and in many sectors of its economy. The addition of academic standards that focus on climate change is important so that all students will have a basic understanding of the climate system, including the natural and human-caused factors that affect it. The underpinnings of climate change span across physical, life, as well as Earth and space sciences. The goal is for students to understand climate science as a way to inform decisions that improve quality of life for themselves, their community, and globally and to know how engineering solutions can allow us to mitigate impacts, adapt practices, and build resilient systems.

Dissection Law
N.J.S.A. 18A:35-4.25 and N.J.S.A. 18A:35-4.24 authorizes parents or guardians to assert the right of their children to refuse to dissect, vivisect, incubate, capture or otherwise harm or destroy animals or any parts thereof as part of a course of instruction.

Forensic Science

Unit 1: What is Forensic Science?

Time Allotted: Approximately 3-4 Weeks

New Jersey Student Learning Standards (NJSLS)

HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
Engaging in Argument from Evidence • Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence. **Asking Questions and Defining Problems** • Analyze complex real-world problems by specifying criteria and constraints for successful solutions.	**LS3.B: Variation of Traits** • In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. • Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus the variation and distribution of traits observed depends on both genetic and environmental factors. **ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.	**Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. - *Connections to Engineering, Technology, and Applications of Science* **Influence of Science, Engineering, and Technology on Society and the Natural World** • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)
• What is forensic science? • How did forensic science develop? • What does a forensic scientist do? • How is a forensic lab setup? • What is the difference between the Bergen County crime lab and the NJ State crime lab? • How can we effectively communicate	**The students will be able to:** • Define forensics science • Explain the roles and responsibilities of forensic scientist • Perform measurements using Bertillon's technique and use the data to discriminate between	**Laboratory Investigations:** *Application of scientific and technical skills as well as Inquiry investigation where students will analyze data and construct claims:* • Bertillon Measurement Lab: Students measure different body parts using Bertillon's measurements as a guide. Then see if they can use these	**Formative and Summative:** • Performing Bertillon measurements and analyzing its accuracy for identifying individuals • Describing the role of forensic scientist, and the areas of a crime lab

ideas?	different people ● Analyze and interpret genetic data in order to determine who murdered the victim ● Describe the areas of a crime laboratory ● Explain characteristics of local, state and federal crime laboratories ● Describe important individual that contributed to forensic science ● Explain the legal aspects of analysis of evidence- Daubert Criteria and Frye Standard ● Research and present notorious crimes	measurements to identify a student in the class. ● Murder and Genetics Lab: Students determine blood type of suspects and analyze DNA profiles and familial connections to determine who killed Capt. Relish. ● Deadly Picnic Activity: Students analyze and discuss crime scene evidence to determine the killer. *Effectively Communicate Information* ● Notorious Crimes Presentations: Students research and prepare presentation about a notorious crime ● Case Studies and Current Events Mini Presentations: Each week, students research, present and discuss an interesting case.	● Explaining legal aspects of scientific admissibility ● Research and present notorious crimes and pertinent case studies ● Demonstrating mastery through: ○ Summative Assessments ○ Laboratory activities ○ Presentations
Resources/Materials	● Tape measures, graph paper, Data and lab handouts ● Presentation Technology: Keynote, Google Presentation,PowerPoint ● https://www.fbi.gov/history/famous-cases		
ELA Companion Standards	**WHST.9-12.2**: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research **RST.11-12.1**: Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.		
Interdisciplinary Connections	***Connections to NJSLS – English Language Arts*:** **SL.11-12.1**. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. **SL.11-12.4** Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate ***Connections to NJSLS* – Mathematics**		

	MP.4: Model with mathematics. **NJSLSA.SL1** Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively. **NJSLSA.SL2** Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
Career Readiness, Life Literacies and Key Skills	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs **9.2.12.CAP.4:** Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them including educational training requirements, costs, loans, and debt repayment **9.2.12.CAP.5:** Assess and modify a personal plan to support current interests and postsecondary plans. **9.2.12.CAP.6:** Identify transferable skills in career choices and design alternative career plans based on those skills. **9.2.12.CAP.7:** Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest. **9.2.12.CAP.8:** Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **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). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices** Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively. Work productively in teams while using cultural/global competence.
Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.2.12.ED.5:** Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics). **8.2.12.ED.6:** Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor). **8.2.12.ETW.4:** Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.

Modifications

Multi-Lingual Learners	Special Education	At-Risk	Gifted and Talented
● Display labeled images of individuals, terms and content ● Use body movement and gestures to further explain concepts to students.	● Provide adequate scaffolds for the educational process. ● Provide alternative choices (i.e. verbal or visual) to demonstrate	● Incorporate student choice ● Invite parents, neighbors, friends, the school principal and other community members to support classroom activities.	● Take on an additional or more complex crime scene challenge.

• Restate design steps aloud before project activity. • Assign a native language partner.	proficiency. • Provide an outline of lessons • Get a written list of instructions • Work or take a test in a different setting, such as a quiet room with few distractions. • Sit where they learn best (for example, near the teacher). • Use an alarm to help with time management. • Work with a partner.	• Provide peer mentoring to improve techniques.	• Interview someone in the field of forensic science about how they use the analysis in their profession

Forensic Science

Unit 2: Analysis of the Crime Scene

Time Allotted: 3-4 Weeks

New Jersey Student Learning Standards (NJSLS)

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
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.

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
Asking Questions and Defining Problems • Analyze complex real-world problems by specifying criteria and constraints for successful solutions. **Constructing Explanations and Designing Solutions** • Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.	**ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. **ETS1.B: Developing Possible Solutions** • When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.	*Connections to Engineering, Technology, and Applications of Science* **Influence of Science, Engineering, and Technology on Society and the Natural World** • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)
● How can the recreation of a crime scene aid in its solution? ● What are proper evidence collection and preservation techniques? ● How can eyewitness testimony be both helpful and harmful to an investigation?	**The Students will be able to:** ● Perform the role of the forensic scientists by conducting a proper systematic search, properly recording and packaging evidence and maintaining the chain of custody at a crime scene ● Evaluate the legitimacy of eyewitness testimony by enacting mock crime scenes and analyzing the information observed ● Research case studies that demonstrate legal issues of search and seizure of evidence ● Evaluate the cost of running a crime lab ● Build a 3-d model of a crime scene with evidence	**Laboratory Investigations:** *Application of Scientific and technical skills as well as Inquiry investigation where students will analyze data and construct claims:* ● Analyzing a mock crime scene: Teacher creates mock crime scenes for the students to "process and record evidence". Class discusses what they did correctly and what would need to improve ● Crime Scene Sketching-Sketch Artist Activity: Students create a simple crime scene somewhere in the school with evidence. They then measure a and create an accurate sketch to scale using templates. ● Crime Scene Skits-Is Eyewitness Testimony Reliable? : Students perform quick skits that are observed by class. The next day they are tasked with recording observations about the scene they saw. ● Diagnostic Forensics Solutions Inc: Students are given a budget and based on a crime that occurred determine which tests are necessary by calculating the costs. Then communicating with the police department explaining their needs and why.	**Formative and Summative:** ● Ability to perform a proper systematic search, package evidence maintaining the chain of custody ● Evaluating the legitimacy of of eyewitness testimony ● Evaluating the cost of running a crime lab ● Researching case studies and communicating them to the class ● Designing a model of a crime scene ● Demonstrating mastery through: ○ Summative Assessments ○ Laboratory activities ○ Class participation ○ Project ○ Presentation

		Effectively Communicate Information: ● Clay Crime Scenes Project: Students create crime stories and represent the crime scene in 3-dimensions. Students present and class discusses ● Case Studies and Current Events Mini Presentations: Each week, students research, present and discuss an interesting case.	
Resources/Materials	● Mock crime scene evidence, gloves, forceps, bags, vials, rulers ● Clay and large plastic bins with lids ● Presentation Technology:Keynote, Google Presentation,PowerPoint ● http://aboutforensics.co.uk/case-studies/ ● https://www.science.gov/topicpages/f/forensic+case+study.html		
ELA Companion Standards	**RST.9-10.8:** Determine if the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. **RST.11-12.1**: Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. **RST.11-12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.9:** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **WHST.9-12.1**: Write arguments focused on discipline-specific content. **WHST.9-12.2**: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes **WHST.9-12.7:** Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research		
Interdisciplinary Connections	***Connections to NJSLS – English Language Arts*:** **SL.11-12.1**. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. **SL.11-12.4** Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.		

	SL.11-12.6. Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate ***Connections to NJSLS – Mathematics:*** **MP.4:** Model with mathematics. **MP.2**: Reason abstractly and quantitatively **HSN-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. **HSN-Q.A.2:** Define appropriate quantities for the purpose of descriptive modeling. **HSS-ID.A.1:** Represent data with plots on the real number line. **HSS-IC.B.6:** Evaluate reports based on data
Career Readiness, Life Literacies and Key Skills	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs **9.2.12.CAP.6:** Identify transferable skills in career choices and design alternative career plans based on those skills. **9.2.12.CAP.7:** Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest. **9.2.12.CAP.8:** Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **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). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices** Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively. Work productively in teams while using cultural/global competence.
Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.1.12.DA.6:** Create and refine computational models to better represent relationships among different elements of data collected from a phenomena or process.

Modifications			
Multi-Lingual Learners	**Special Education**	**At-Risk**	**Gifted and Talented**
● Display labeled images of individuals, terms and content ● Use body movement and gestures to further explain concepts to students. ● Restate design steps aloud before	● Provide extended time for the creation of products. ● Scaffolded explanations for proper use of equipment. ● Provide an outline of lessons ● Get a written list of instructions	● Provide an outline for project tasks. ● Incorporate student choice ● Use effort and achievement rubrics ● Assure students they can be successful. ● Allow students many opportunities	● Take on additional or more complex crime scene challenges. ● Interview someone in the field of forensic science about how they use the analysis in their profession.

project activity. • Assign a native language partner. • When possible, modify assignments so the student writes less, has simpler questions to answer, fewer spelling, etc. • Provide a variety of texts and resources on curriculum topics at a range of reading levels. • Provide models of completed assignments, projects, etc.	• Receive large project as smaller tasks with individual deadlines • Work or take a test in a different setting, such as a quiet room with few distractions. • Sit where they learn best (for example, near the teacher). • Use an alarm to help with time management. • Work with a partner.	for practice and learning. • Use scaffolding for complex tasks • Evaluate students on the basis of mastery and not one another. • Provide peer mentoring to improve techniques.	

Forensic Science

Unit 3: Types of Physical Evidence

Time Allotted: Approximately 2 Weeks

New Jersey Student Learning Standards (NJSLS)

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-PS2-6 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
Asking Questions and Defining Problems • Analyze complex real-world problems by specifying criteria and constraints for successful solutions. **Obtaining, Evaluating, and Communicating Information** • Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).	**ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. **PS2.B: Types of Interactions** • Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.	**Structure and Function** • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. - *Connections to Engineering, Technology, and Applications of Science* **Influence of Science, Engineering, and Technology on Society and the Natural World** • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)

• What can a forensic scientist determine from the different types of physical evidence?
• Why is individual evidence more probative than class evidence?
• How is physical evidence used to reconstruct a crime scene?
	The students will be able to:
	• Analyze, describe and compare different types of physical evidence
	• Compare Individual and Class evidence and provide examples of each
	• Reconstruct crime scenes using different types of physical evidence
	• Model different types of pattern evidence and interpret to solve crime
		Laboratory Investigations:
		Application of Scientific and technical skills as well as Inquiry investigation where students will analyze data and construct claims:
		• Tire Tread Examination Lab: Students use toy cars to make pattern evidence, then analyze and compare the prints to reconstruct the crime scene.
		• Lip Print Lab: Students given a set of lipstick prints; one crime scene and the others are suspects in a jewelry robbery. They record data,, analyze and compare prints to determine who stole the diamonds.
		• Shoe Print Lab: Students practice making their own shoe prints and then are given crime scene prints. They make prints of the suspects shoes, compare and determine who robbed the pizza parlour.
			Formative and Summative:
			• Analyzing, describing and comparing different types of physical evidence
			• Comparing Individual and Class evidence and provide examples of each
			• Reconstructing crime scenes using different types of physical evidence
			• Modeling different types of pattern evidence and interpret to solve crime
			• Demonstrating mastery through:
			  ○ Summative Assessments
			  ○ Laboratory activities

Resources/Materials	• Toy cars with tread mark up; shoes, ink, paper, inkless chemical and special paper; lipstick prints • Presentation Technology:Keynote, Google Presentation,PowerPoint • http://aboutforensics.co.uk/case-studies/ • https://www.science.gov/topicpages/f/forensic+case+study.html		

ELA Companion Standards	**RST.11-12.1**: Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. **RST.11-12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.9:** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **WHST.9-12.1**: Write arguments focused on discipline-specific content. **WHST.9-12.2**: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research
Interdisciplinary Connections	***Connections to NJSLS – English Language Arts*:** **SL.11-12.1**. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. **SL.11-12.4** Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate ***Connections to NJSLS – Mathematics:*** **MP.4:** Model with mathematics. **MP.2**: Reason abstractly and quantitatively **HSN-Q.A.2:** Define appropriate quantities for the purpose of descriptive modeling. **HSS-ID.A.1:** Represent data with plots on the real number line. **HSS-IC.B.6:** Evaluate reports based on data
Career Readiness, Life Literacies and Key Skills	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs **9.2.12.CAP.6:** Identify transferable skills in career choices and design alternative career plans based on those skills. **9.2.12.CAP.7:** Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest. **9.2.12.CAP.8:** Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **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). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices**

	Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively. Work productively in teams while using cultural/global competence.
Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.1.12.DA.6:** Create and refine computational models to better represent relationships among different elements of data collected from a phenomena or process. **8.2.12.ED.5:** Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics). **8.2.12.ED.6:** Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).

Modifications			
Multi-Lingual Learners	**Special Education**	**At-Risk**	**Gifted and Talented**
● When possible, modify assignments so the student writes less, has simpler questions to answer, fewer spelling words, etc. ● Provide models of completed homework assignments, projects, etc. ● Assign a native language partner. ● Use sentence/paragraph frames to assist with writing peer review. ● Provide extended time for written responses and reports.	● Use scaffolds, such as prompting to assist with the design process. ● Provide extended time for written responses and reports. ● Use a graphic organizer to categorize concepts. ● Get a written list of instructions. ● Receive large project as smaller tasks with individual deadlines. ● Work or take a test in a different setting, such as a quiet room with few distractions. ● Sit where they learn best (for example, near the teacher). ● Use an alarm to help with time management. ● Work with a partner.	● Use a graphic organizer to categorize concepts. ● Provide an outline for research and design tasks. ● Provide extended time for written responses and reports. ● Incorporate student choice ● Provide peer mentoring to improve techniques ● Use effort and achievement rubrics ● Assure students they can be successful ● Allow students many opportunities for practice and learning ● Use scaffolding for complex tasks ● Evaluate students on the basis of mastery and not one another.	● Take on an additional or more complex crime scene challenge. ● Interview someone in the field of forensic science about how they use the analysis in their profession. ● Offer choices, once finished with a basic task, with personal interest being the key.

Forensic Science		
Unit 4: Physical Properties of Glass and Soil		
Time Allotted: Approximately 2-3 Weeks		
New Jersey Student Learning Standards (NJSLS)		
HS-PS4-1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media		
HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.		
HS-PS2-6 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.		
HS-ESS2-6 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Asking Questions and Defining Problems • Analyze complex real-world problems by specifying criteria and constraints for successful solutions. **Using Mathematics and Computational Thinking** • Use mathematical representations of phenomena or design solutions to describe and/or support claims and/or explanations. **Obtaining, Evaluating, and Communicating Information** • Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). **Developing and Using Models** • Develop a model based on evidence to illustrate the relationships between systems or between components of a system.	**ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. **PS4.A: Wave Properties** • The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. **PS2.B: Types of Interactions** • Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. **ESS2.D: Weather and Climate** • Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. • Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.	**Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. **Structure and Function** • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. **Energy and Matter** • The total amount of energy and matter in closed systems is conserved. - *Connections to Engineering, Technology, and Applications of Science* **Influence of Science, Engineering, and Technology on Society and the Natural World** • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)
● How can the chemical and physical properties of glass and soil be used as evidence? ● How can glass fracture patterns be used to reconstruct a crime scene?	**The students will be able to**: ● Describe different types of glass and soil ● Distinguish glass and soil samples using various techniques ● Measure and calculate the density of various glass samples ● Compare the flotation and immersion method for determining density ● Calculate refractive index as a means for distinguishing glass samples	**Laboratory Investigations**: *Application of scientific and technical skills and Inquiry investigation where students will analyze data and construct claims:* ● Glass Density Lab: Students will use the principle of density to distinguish between glass samples and eventually match a known glass to solve a crime. ● Refractive Index of Glass Lab: Students will calculate the refractive index of glass and plastic specimens using Snell's Law. ● Big Glass Lab: This culminating activity allows students to tie together all aspects of glass analysis including density, refractive index, and fracture patterns. ● Murder on the Beach Lab: Students will examine the gross analysis of soil samples for their color, texture, luster, and crystalline structure.	**Formative and Summative:** ● Analyzing, describing and comparing different types of glass and soil ● Comparing glass and soil evidence and provide examples of each ● Reconstructing crime scenes based on glass fracture patterns ● Demonstrating mastery through: ○ Summative Assessments ○ Laboratory activities
Resources/Materials	● Glass and plastic samples ● Soil samples ● Lasers, protractors, rulers ● Scientific glassware		
ELA Companion Standards	**RST.11-12.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.9:** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **WHST.9-12.1**: Write arguments focused on discipline-specific content. **WHST.9-12.2**: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research		
Interdisciplinary Connections	***Connections to NJSLS – English Language Arts*:** **SL.11-12.1**. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source.		

	SL.11-12.4 Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate ***Connections to NJSLS – Mathematics:*** **MP.4:** Model with mathematics. **MP.2**: Reason abstractly and quantitatively **HSN-Q.A.2:** Define appropriate quantities for the purpose of descriptive modeling. . **HSS-IC.B.6:** Evaluate reports based on data
Career Readiness, Life Literacies and Key Skills	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs **9.2.12.CAP.6:** Identify transferable skills in career choices and design alternative career plans based on those skills. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **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). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices** Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively. Work productively in teams while using cultural/global competence.
Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.1.12.DA.6:** Create and refine computational models to better represent relationships among different elements of data collected from a phenomena or process. **8.2.12.ED.5:** Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics). **8.2.12.ED.6:** Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor). **8.2.12.D.5** Explain how material processing impacts the quality of engineered and fabricated products.

Modifications			
Multi-Lingual Learners	**Special Education**	**At-Risk**	**Gifted and Talented**
● When possible, modify assignments so the student writes less, has simpler questions to	● Use scaffolds, such as prompting to assist with the design process. ● Provide extended time for written	● Use a graphic organizer to categorize concepts.	● Take on an additional or more complex crime scene challenge.

answer, fewer spelling words, etc. • Provide models of completed homework assignments, projects, etc. • Assign a native language partner. • Use sentence/paragraph frames to assist with writing peer review. • Provide extended time for written responses and reports.	responses and reports. • Use a graphic organizer to categorize concepts. • Get a written list of instructions • Receive large project as smaller tasks with individual deadlines • Work or take a test in a different setting, such as a quiet room with few distractions • Sit where they learn best (for example, near the teacher) • Use an alarm to help with time management • Work with a partner	• Offer choices beyond standard learning activities, with personal interest being the key. • Provide an outline for research and design tasks. • Provide extended time for written responses and reports. • Incorporate student choice • Provide peer mentoring to improve techniques • Use effort and achievement rubrics • Assure students they can be successful • Allow students many opportunities for practice and learning • Use scaffolding for complex tasks • Evaluate students on the basis of mastery and not one another.	• Interview someone in the field of forensic science about how they use the analysis in their profession. • Offer choices beyond standard learning activities, with personal interest being the key.

Forensic Science

Unit 5: Analysis of Hair and Fiber

Time Allotted: Approximately 1-2 Weeks

New Jersey Student Learning Standards (NJSLS)

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-PS2-6 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
Asking Questions and Defining Problems • Analyze complex real-world problems by specifying criteria and constraints for successful solutions. **Obtaining, Evaluating, and Communicating Information** • Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).	**ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. **PS2.B: Types of Interactions** • Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and	**Structure and Function** • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. - *Connections to Engineering, Technology, and Applications of Science*

	transformations of matter, as well as the contact forces between material objects.	**Influence of Science, Engineering, and Technology on Society and the Natural World** • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)
• What are the differences between animal and human hair? • How can one distinguish between different types of hair? • How can one differentiate fiber and fabric types? • Besides microscopic examination, how would a forensic scientist analyze fibers?	**The students will be able to:** • Microscopically examine, compare and distinguish the morphological characteristics of various types of animal hair and human hair in order to identify what type of hair is at the crime scene • Microscopically analyze, compare and distinguish the morphological characteristics of fibers to identify what type of fiber is at the crime scene • Perform various chemical and physical tests to determine types of fabric samples and interpret results for crime scene analysis	**Laboratory investigations**: *Application of Scientific and technical skills as well as Inquiry investigation where students will analyze data and construct claims:* • Analysis of Hair Lab: This lab has several activities. Including: -Creating slides of their own hair -Observing prepared slides of other types of animals -Comparing, recording data and determining type of hair found at two different crime scenes • Fiber Analysis Lab: Students create slides of a fiber from their clothes, observe prepared slides of different types of fibers and fabric types using the microscope • Fiber and Fabric Chemical Analysis BIG Lab: This lab has a combination of tests that allow students to chemically and physically observe, analyze and record data about different types of fibers and fabrics. Then use this data to determine crime scene fabrics.	**Formative and Summative:** • Microscopically examining, comparing and distinguishing the morphological characteristics of hair and fibers. • Performing various chemical and physical tests to determine types of fabric samples and interpret results for crime scene analysis • Demonstrate mastery through: ○ Summative Assessments ○ Laboratory activities
Resources/Materials	• Animal types and human types of hair prepared slides; blank slides and coverslips, glycerol, microscopes • Fiber and fabric types prepared slides; fabric samples • Chemicals needed for tests, bunsen or alcohol burners;		
ELA Companion Standards	**RST.11-12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.		

	RST.11-12.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.9:** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **WHST.9-12.1**: Write arguments focused on discipline-specific content. **WHST.9-12.2**: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research
Interdisciplinary Connections	***Connections to NJSLS – English Language Arts*:** **SL.11-12.1**. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. **SL.11-12.4** Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate ***Connections to NJSLS – Mathematics:*** **MP.4:** Model with mathematics. **MP.2**: Reason abstractly and quantitatively **HSN-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. **HSS-IC.B.6:** Evaluate reports based on data
Career Readiness, Life Literacies and Key Skills	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs **9.2.12.CAP.6:** Identify transferable skills in career choices and design alternative career plans based on those skills. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **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). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices** Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively. Work productively in teams while using cultural/global competence.
Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of

	real-world phenomena. **8.1.12.DA.6:** Create and refine computational models to better represent relationships among different elements of data collected from a phenomena or process. **8.2.12.ED.5:** Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics). **8.2.12.ED.6:** Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor). **8.2.12.D.5** Explain how material processing impacts the quality of engineering and fabricated products.

Modifications

Multi-Lingual Learners	Special Education	At-Risk	Gifted and Talented
● When possible, modify assignments so the student writes less, has simpler questions to answer, fewer spelling words, etc. ● Provide models of completed homework assignments, projects, etc. ● Assign a native language partner. ● Use sentence/paragraph frames to assist with writing peer review. ● Provide extended time for written responses and reports.	● Provide additional time for project development. ● Work with a peer ● Break the assignment into smaller pieces. ● Utilize graphics to support learning. ● Provide an outline of lessons ● Get a written list of instructions ● Receive large project as smaller tasks with individual deadlines ● Work or take a test in a different setting, such as a quiet room with few distractions ● Sit where they learn best (for example, near the teacher)	● Break the investigation process into smaller pieces. ● Conference with the teacher during the process. ● Provide a detailed framework for the project design. ● Incorporate student choice ● Provide peer mentoring to improve techniques ● Use effort and achievement rubrics ● Assure students they can be successful ● Promote mastery or challenging tasks ● Allow students many opportunities for practice and learning ● Use scaffolding for complex tasks ● Evaluate students on the basis of mastery and not one another.	● Offer choices, once finished with a basic task, with personal interest being the key. ● Develop and research more complex cases both individually and in collaboration with peers.

Forensic Science

Unit 6: Forensic Chemistry and Toxicology

Time Allotted: Approximately 4-5 Weeks

New Jersey Student Learning Standards (NJSLS)

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-PS2-6 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Science & Engineering Practices

Asking Questions and Defining Problems

- Analyze complex real-world problems by specifying criteria and constraints for successful solutions.

Obtaining, Evaluating, and Communicating Information

- Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).

Planning and Carrying Out Investigations

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods

- Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Disciplinary Core Ideas

ETS1.A: Defining and Delimiting Engineering Problems

- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.
- Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

PS2.B: Types of Interactions

- Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.

LS1.A: Structure and Function

- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.

Cross-Cutting Concepts

Structure and Function

- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.

Stability and Change

- Feedback (negative or positive) can stabilize or destabilize a system.

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)
● What are the physiological and neurological effects of drugs on the body? ● How are the negative short term and long term effects of drugs directly related to their physiological function in the body? ● How can drugs and poisons be identified?	**The students will be able to**: ● Describe chromatography and compare the different types ● Identify and analyze GC Mass spectrograms of various drugs ● Explain how drugs are analyzed using GC Mass Spec and Infrared Spectrophotometry ● Describe different chemical spot tests that are used to analyze drugs	**Laboratory Investigations:** *Effective Communication Skills:* ● Drug Presentations: Students will research and present the physiological and neurological effects of drugs on the body. The goal is to understand how the desired effects of the drug lead to the negative short term and long term effects. *Application of scientific and technical skills and Inquiry investigation where students will analyze data and construct claims*: ● White Powder Lab: Students will perform various chemical tests to distinguish drug samples from each other culminating in identifying an unknown white powder. ● Over the Counter Drug Lab: Students will perform various chemical tests to distinguish drug samples from each other culminating in identifying unknown pills. ● Coroner's Report Lab: Students will read coroner's reports to identify the time, cause, and manner of death of different individuals.	**Formative and Summative:** ● Performing various chemical and physical tests to determine types of drugs and poisons and interpret results for crime scene analysis ● Research and present the effects of drugs in the body ● Demonstrate mastery through: ○ Summative Assessments ○ Laboratory activities ○ Presentation
Resources/Materials	● White power chemicals (starch, calcium chloride, etc) and over the counter pills (asprin, Rolaids, Tums, etc) ● Presentation Technology:Keynote, Google Presentation,PowerPoint		
ELA Companion Standards	**RST.11-12.1**: Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. **RST.11-12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.		

	RST.11-12.9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **WHST.9-12.1**: Write arguments focused on discipline-specific content. **WHST.9-12.2**: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research
Interdisciplinary Connections	***Connections to NJSLS – English Language Arts*:** **SL.11-12.1**. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. **SL.11-12.4** Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate ***Connections to NJSLS – Mathematics:*** **MP.4:** Model with mathematics. **MP.2**: Reason abstractly and quantitatively **HSN-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. **HSN-Q.A.2:** Define appropriate quantities for the purpose of descriptive modeling. **HSS-ID.A.1:** Represent data with plots on the real number line. **HSS-IC.B.6:** Evaluate reports based on data
Career Readiness, Life Literacies and Key Skills	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs **9.2.12.CAP.6:** Identify transferable skills in career choices and design alternative career plans based on those skills. **9.2.12.CAP.7**: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest. **9.2.12.CAP.8**: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **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). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices** Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management.

	Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively. Work productively in teams while using cultural/global competence.
Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.1.12.DA.6:** Create and refine computational models to better represent relationships among different elements of data collected from a phenomena or process. **8.2.12.ED.5:** Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics). **8.2.12.ED.6:** Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).

Modifications

Multi-Lingual Learners	Special Education	At-Risk	Gifted and Talented
● When possible, modify assignments so the student writes less, has simpler questions to answer, fewer spelling words, etc. ● Provide models of completed homework assignments, projects, etc. ● Assign a native language partner. ● Use sentence/paragraph frames to assist with writing peer review. ● Provide extended time for written responses and reports.	● Use scaffolds, such as prompting to assist with the design process. ● Provide extended time for written responses and reports. ● Use a graphic organizer to categorize concepts. ● Get a written list of instructions ● Receive large project as smaller tasks with individual deadlines ● Work or take a test in a different setting, such as a quiet room with few distractions ● Sit where they learn best (for example, near the teacher) ● Use an alarm to help with time management ● Work with a partner	● Use a graphic organizer to categorize concepts. ● Provide an outline for research and design tasks. ● Provide extended time for written responses and reports. ● Incorporate student choice ● Provide peer mentoring to improve techniques ● Use effort and achievement rubrics ● Assure students they can be successful ● Promote mastery or challenging tasks ● Allow students many opportunities for practice and learning ● Use scaffolding for complex tasks ● Evaluate students on the basis of mastery and not one another.	● Take on an additional or more complex crime scene challenge. ● Interview someone in the field of forensic science about how they use the analysis in their profession. ● Offer choices, once finished with a basic task, with personal interest being the key.

Forensic Science

Unit 7: Serology

Time Allotted: Approximately 2-3 Weeks

New Jersey Student Learning Standards (NJSLS)

HS-PS2-1 Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-PS2-2 Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
Asking Questions and Defining Problems • Analyze complex real-world problems by specifying criteria and constraints for successful solutions. **Analyzing and Interpreting Data** • Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. **Using Mathematics and Computational Thinking** • Use mathematical representations of phenomena to describe explanations. *Connections to Nature of Science* **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** • Theories and laws provide explanations in science. • Laws are statements or descriptions of the relationships among observable phenomena.	**ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. **PS2.A: Forces and Motion** • Newton's second law accurately predicts changes in the motion of macroscopic objects. **PS2.A: Forces and Motion** • Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. • If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system.	**Systems and System Models** • When investigating or describing a system, the boundaries and initial conditions of the system need to be defined. **Cause and Effect** • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. *Connections to Engineering, Technology, and Applications of Science* **Influence of Science, Engineering, and Technology on Society and the Natural World** • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)
• What are the characteristics of the various components of blood? • Can one distinguish between different people's blood? • How can blood spatter be used to reconstruct a crime scene?	**The students will be able to:** • Investigate and interpret ABO blood type data in a crime scene scenario • Examine the component characteristics of blood • Calculate the distance and angle of blood spatter patterns • Measure blood spatter data to in order to determine the point of	**Laboratory Investigations::** *Application of Scientific and technical skills as well as Inquiry investigation where students will analyze data and construct claims:* • Microscopic Examination of Blood Activity : Students observe prepared blood smears under the microscope. Record and label • ABO Blood Type Lab: Students perform blood typing tests using	**Formative and Summative:** • Investigating and interpreting ABO blood type data in a crime scene scenario • Examining the component characteristics of blood • Calculating the distance and angle of blood spatter patterns • Measuring blood spatter data to in order to determine the point of

	origin of blood spatter and reconstruct the crime scene	simulated blood and antibodies. Record, compare and determine whose blood was found at crime scene burglary. ● Blood Spatter Pattern Lab: Using simulated transfer blood, students explore blood spatter patterns at different heights and angles. Then using this data and calculation, they determine the height and angle of different crime scene spatter patterns.	origin of blood spatter and reconstruct the crime scene ● Demonstrate mastery through: ○ Summative assessments ○ Laboratory activities ○ Class participation
Resources/Materials	● Blood prepared slides; microscopes; ● Artificial blood types A, B, AB and O; Anti-A and B blood samples ● Artificial transfer blood for spatter recreation, string, protractors, rulers		
ELA Companion Standards	**RST.9-10.8:** Determine if the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. **RST.11-12.1**: Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. **RST.11-12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.9:** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **WHST.9-12.1**: Write arguments focused on discipline-specific content. **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research		
Interdisciplinary Connections	***Connections to NJSLS – English Language Arts*:** **SL.11-12.1**. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. **SL.11-12.4** Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate ***Connections to NJSLS – Mathematics:*** **MP.4:** Model with mathematics.		

	MP.2: Reason abstractly and quantitatively **HSN-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. **HSN-Q.A.2:** Define appropriate quantities for the purpose of descriptive modeling. **HSS-ID.A.1:** Represent data with plots on the real number line. **HSS-IC.B.6:** Evaluate reports based on data
Career Readiness, Life Literacies and Key Skills	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs **9.2.12.CAP.6:** Identify transferable skills in career choices and design alternative career plans based on those skills. **9.2.12.CAP.7**: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest. **9.2.12.CAP.8**: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **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). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices** Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively. Work productively in teams while using cultural/global competence.
Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.1.12.DA.6:** Create and refine computational models to better represent relationships among different elements of data collected from a phenomena or process. **8.2.12.ED.5:** Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics). **8.2.12.ED.6:** Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).

Modifications			
Multi-Lingual Learners	**Special Education**	**At-Risk**	**Gifted and Talented**
● When possible, modify assignments so the student writes less, has simpler questions to answer, fewer spelling words, etc. ● Provide models of completed homework assignments, projects,	● Provide additional time for project development. ● Work with a peer ● Break the assignment into smaller pieces. ● Utilize graphics to support learning.	● Break the design process into smaller pieces. ● Conference with the teacher during the process. ● Provide a detailed framework for the project design.	● Offer choices, once finished with a basic task, with personal interest being the key. ● Develop and research more complex scenarios both individually and in collaboration

etc. • Assign a native language partner. • Use sentence/paragraph frames to assist with writing peer review. • Provide extended time for written responses and reports.	• Provide an outline of lessons • Get a written list of instructions • Receive large project as smaller tasks with individual deadlines • Work or take a test in a different setting, such as a quiet room with few distractions • Sit where they learn best (for example, near the teacher)	• Incorporate student choice • Provide peer mentoring to improve techniques • Use effort and achievement rubrics • Assure students they can be successful • Promote mastery or challenging tasks • Allow students many opportunities for practice and learning • Use scaffolding for complex tasks • Evaluate students on the basis of mastery and not one another.	with peers.

Forensic Science

Unit 8: Analysis of DNA Evidence

Time Allotted: Approximately 1-2 Weeks

New Jersey Student Learning Standards (NJSLS)

HS-LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS-LS1-6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon based molecules.
HS-LS3-1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
HS-LS3-3 Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
Constructing Explanations and Designing Solutions • Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	**LS1.A: Structure and Function** • Systems of specialized cells within organisms help them perform the essential functions of life. • All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. **LS1.B: Growth and Development of Organisms** • In multicellular organisms' individual cells grow and then divide via a process called mitosis, thereby allowing the organism to grow. The organism begins as a single cell (fertilized egg) that divides	**Structure and Function** • Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.

Developing and Using Models

- Use a model based on evidence to illustrate the relationships between systems or between components of a system.

Asking Questions and Defining Problems

- Ask questions that arise from examining models or a theory to clarify relationships.
- Analyze complex real-world problems by specifying criteria and constraints for successful solutions.

Engaging in Argument from Evidence

- Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence.

Analyzing and Interpreting Data

- Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible.

successively to produce many cells, with each parent cell passing identical genetic material (two variants of each chromosome pair) to both daughter cells. Cellular division and differentiation produce and maintain a complex organism, composed of systems of tissues and organs that work together to meet the needs of the whole organism.

LS3.A: Inheritance of Traits

- Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function.

LS3.B: Variation of Traits

- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited.
- Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. Thus, the variation and distribution of traits observed depends on both genetic and environmental factors.

LS1.C: Organization for Matter and Energy Flow in Organisms

- The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells.
- As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.

ETS1.A: Defining and Delimiting Engineering Problems

- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.
- Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering.

Systems and System Models

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Energy and Matter

- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Scale, Proportion, and Quantity

- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth).

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World

- New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Connections to Nature of Science

Science is a Human Endeavor

- Technological advances have influenced the progress of science and science has influenced advances in technology. (HS-LS3-3)

	These global challenges also may have manifestations in local communities.	• Science and engineering are influenced by society and society is influenced by science and engineering.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)

• What are the characteristics of DNA that are unique to every individual?
• How is DNA tested and analyzed?
	The students will be able to::
	• Explain how nuclear DNA is extracted from cells
	• Compare coding and non-coding regions of DNA
	• Describe methods used to separate and differentiate DNA
	• Explain how a DNA profile is developed
	• Analyze results of STR report
		Laboratory Investigations:
		Application of scientific and technical skills:
		• DNA Extraction from Strawberries: Students will extract and purify DNA from strawberries as a demonstration of how DNA can be obtained from any cells.
		Inquiry investigation where students will analyze data and construct claims:
		• Electrophoresis Lab: Students will use micropipettes to load DNA samples into an agarose gel and then run electrophoresis. They will then do DNA fingerprinting to identify a suspect from a crime scene.
		• Elephant DNA Simulation: Students will cut segments of DNA to determine if the sample is African elephant or wooly mammoth DNA
			Formative and Summative:
			• Ability to extract DNA from strawberries
			• RFLP analysis of simulated elephant and mammoth DNA
			• Demonstrate mastery through:
			  ○ Summative Assessments
			  ○ Laboratory activities

Resources/Materials	• Electrophoresis equipment • Strawberries, alcohol, scientific glassware • Scissors, tape		
ELA Companion Standards	**RST.11-12.1**: Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. **RST.11-12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.9:** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.		

	WHST.9-12.1: Write arguments focused on discipline-specific content. **WHST.9-12.2**: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research
Interdisciplinary Connections	***Connections to NJSLS – English Language Arts*:** **SL.11-12.1**. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. **SL.11-12.4** Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate ***Connections to NJSLS – Mathematics:*** **MP.4:** Model with mathematics. **MP.2**: Reason abstractly and quantitatively **HSN-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. **HSS-ID.A.1:** Represent data with plots on the real number line. **HSS-IC.B.6:** Evaluate reports based on data
Career Readiness, Life Literacies and Key Skills	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs **9.2.12.CAP.6:** Identify transferable skills in career choices and design alternative career plans based on those skills. **9.2.12.CAP.7**: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest. **9.2.12.CAP.8**: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **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). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices** Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively. Work productively in teams while using cultural/global competence.

Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.1.12.DA.6:** Create and refine computational models to better represent relationships among different elements of data collected from a phenomena or process. **8.2.12.ED.5:** Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics). **8.2.12.ED.6:** Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).

Modifications

Multi-Lingual Learners	Special Education	At-Risk	Gifted and Talented
● When possible, modify assignments so the student writes less, has simpler questions to answer, fewer spelling words, etc. ● Provide models of completed homework assignments, projects, etc. ● Assign a native language partner. ● Use sentence/paragraph frames to assist with writing peer review. ● Provide extended time for written responses and reports.	● Use scaffolds, such as prompting to assist with the design process. ● Provide extended time for written responses and reports. ● Use a graphic organizer to categorize concepts. ● Get a written list of instructions ● Receive large project as smaller tasks with individual deadlines ● Work or take a test in a different setting, such as a quiet room with few distractions ● Sit where they learn best (for example, near the teacher) ● Use an alarm to help with time management ● Work with a partner	● Use a graphic organizer to categorize concepts. ● Provide an outline for research and design tasks. ● Provide extended time for written responses and reports. ● Incorporate student choice ● Provide peer mentoring to improve techniques ● Use effort and achievement rubrics ● Assure students they can be successful ● Promote mastery or challenging tasks ● Allow students many opportunities for practice and learning ● Use scaffolding for complex tasks ● Evaluate students on the basis of mastery and not one another.	● Take on an additional or more complex crime scene challenge. ● Interview someone in the field of forensic science about how they use the analysis in their profession. ● Offer choices, once finished with a basic task, with personal interest being the key.

Forensic Science

Unit 9: Fingerprint Analysis

Time Allotted: Approximately 3-4 Weeks

New Jersey Student Learning Standards (NJSLS)

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts

Asking Questions and Defining Problems • Analyze complex real-world problems by specifying criteria and constraints for successful solutions.	**ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.	*Connections to Engineering, Technology, and Applications of Science* **Influence of Science, Engineering, and Technology on Society and the Natural World** • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)

• How do forensic scientists analyze fingerprints?
• What is the probative value of fingerprints when reconstructing a crime scene?
	The students will be able to:
	• Create a clear fingerprint; examine and determine the type and location of minutiae on their prints
	• Analyze and compare fingerprints by matching ridge characteristics
	• Developing and analyzing latent prints off of porous and nonporous surfaces using methods: Dusting with magnetic powder; ninhydrin solution and fuming with cyanoacrylate liquid
	• Determine the identity of an suspects by using their fingerprints
		Laboratory Investigations:
		Application of Scientific and technical skills as well as Inquiry investigation where students will analyze data and construct claims:
		• Inking and Rolling Fingerprint Lab: Students ink and roll their all 10 of their fingerprints onto a fingerprint card, then classify and calculate their FBI Classification Fraction.
		• Classification and Minutiae of Fingerprints Activity: Students given other students fingerprints to classify and identify minutiae.
		• Dusting for Latent Fingerprint Lab: Students practice leaving, dusting and lifting latent prints from paper, plastic and glass.
		• Developing latent prints using Ninhydrin and Cyanoacrylate: Students practice leaving, developing and lifting latent prints from paper, plastic and glass using ninhydrin and cyanoacrylate
		• Who stole the poisonous pathogen? Latent Fingerprint lab: Students are given paper and plastic evidence and they must develop, lift and analyze
			Formative and Summative:
			• Creating a clear fingerprint; examining and determining the type and location of minutiae on their prints
			• Analyzing and comparing fingerprints by matching ridge characteristics
			• Developing and analyzing latent prints off of porous and nonporous surfaces using methods: Dusting with magnetic powder; ninhydrin solution and fuming with cyanoacrylate liquid
			• Determining the identity of an suspects by using their fingerprints
			• Demonstrate mastery through:
			  ○ Summative Assessments
			  ○ Laboratory activities

		against prints of suspect teachers to determine who stole the poison from Mr.Shields.	
Resources/Materials	● Fingerprint ink, 10 Fingerprints cards, hand lenses ● Magnetic dusting powder, magnetic brushes ● Ninhydrin solution, fume hood, dryer or iron ● Cyanoacrylate liquid, hot plate and fuming chamber ● Latent prints left on paper by perp teacher as evidence for students to analyze		
ELA Companion Standards	**RST.9-10.8:** Determine if the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. **RST.11-12.1**: Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. **RST.11-12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.9:** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **WHST.9-12.2**: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research		
Interdisciplinary Connections	***Connections to NJSLS – English Language Arts*:** **SL.11-12.1**. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. **SL.11-12.4** Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate ***Connections to NJSLS – Mathematics:*** **MP.2**: Reason abstractly and quantitatively **HSN-Q.A.2:** Define appropriate quantities for the purpose of descriptive modeling. **HSS-IC.B.6:** Evaluate reports based on data		
Career Readiness, Life Literacies and Key Skills	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs **9.2.12.CAP.6:** Identify transferable skills in career choices and design alternative career plans based on those skills.		

	9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest. **9.2.12.CAP.8**: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **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). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices** Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively. Work productively in teams while using cultural/global competence.
Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.1.12.DA.6:** Create and refine computational models to better represent relationships among different elements of data collected from a phenomena or process. **8.2.12.ED.5:** Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics). **8.2.12.ED.6:** Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).

Modifications

Multi-Lingual Learners	Special Education	At-Risk	Gifted and Talented
● When possible, modify assignments so the student writes less, has simpler questions to answer, fewer spelling words, etc. ● Provide models of completed homework assignments, projects, etc. ● Assign a native language partner. ● Use sentence/paragraph frames to assist with writing peer review. ● Provide extended time for written responses and reports.	● Provide additional time for project development. ● Work with a peer ● Break the assignment into smaller pieces. ● Utilize graphics to support learning. ● Provide an outline of lessons ● Get a written list of instructions ● Receive large project as smaller tasks with individual deadlines ● Work or take a test in a different setting, such as a quiet room with few distractions ● Sit where they learn best (for example, near the teacher)	● Break the design process into smaller pieces. ● Conference with the teacher during the process. ● Provide a detailed framework for the project design. ● Incorporate student choice ● Provide peer mentoring to improve techniques ● Use effort and achievement rubrics ● Assure students they can be successful ● Promote mastery or challenging tasks ● Allow students many opportunities	● Offer choices, once finished with a basic task, with personal interest being the key. ● Develop and research more complex scenarios both individually and in collaboration with peers.

		for practice and learning • Use scaffolding for complex tasks • Evaluate students on the basis of mastery and not one another.	

Forensic Science		
Unit 10: Arson and Explosion Investigation		
Time Allotted: Approximately 1 Week		
New Jersey Student Learning Standards (NJSLS)		
HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **HS-PS2-6** Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.		
Science & Engineering Practices	**Disciplinary Core Ideas**	**Cross-Cutting Concepts**
Asking Questions and Defining Problems • Analyze complex real-world problems by specifying criteria and constraints for successful solutions. **Engaging in Argument from Evidence** • Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. - *Connections to Nature of Science* **Scientific Knowledge is Open to Revision in Light of New Evidence** • Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation.	**ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. **LS2.C: Ecosystem Dynamics, Functioning, and Resilience** • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.	**Stability and Change** • Much of science deals with constructing explanations of how things change and how they remain stable. - *Connections to Engineering, Technology, and Applications of Science* **Influence of Science, Engineering, and Technology on Society and the Natural World** • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)

● Why do certain chemicals burn with very specifically colored flames? ● How can the presence of an accelerant be analyzed to determine if a fire was an accident or not?	**The students will be able to:**: ● Distinguish accelerants in arson investigation	**Laboratory Investigations:** *Inquiry investigation where students will analyze data and construct claims:* ● Flame Testing of Metal Salts Lab: Students will conduct flame tests of metal salts as part of an arson investigation to identify an accelerant left at the crime scene.	**Formative and Summative:** ● Ability to flame test different metal salts ● Analyzing different types of arson evidence to solve a crime ● Demonstrate mastery through: ○ Summative Assessments ○ Laboratory activities ○ Class participation
Resources/Materials	● Popsicle sticks soaked in solutions of metal salts, bunsen burners		
ELA Companion Standards	**RST.11-12.1**: Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. **RST.11-12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.9:** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **WHST.9-12.1**: Write arguments focused on discipline-specific content. **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research		
Interdisciplinary Connections	***Connections to NJSLS – English Language Arts*:** **SL.11-12.1**. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. **SL.11-12.4** Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate ***Connections to NJSLS – Mathematics:*** **MP.2**: Reason abstractly and quantitatively **HSN-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. **HSN-Q.A.2:** Define appropriate quantities for the purpose of descriptive modeling. **HSS-IC.B.6:** Evaluate reports based on data		
Career Readiness, Life Literacies and Key Skills	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs		

	9.2.12.CAP.7: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest. **9.2.12.CAP.8**: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **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). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices** Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively. Work productively in teams while using cultural/global competence.
Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.1.12.DA.6:** Create and refine computational models to better represent relationships among different elements of data collected from a phenomena or process. **8.2.12.ED.5:** Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).

Modifications

Multi-Lingual Learners	Special Education	At-Risk	Gifted and Talented
● When possible, modify assignments so the student writes less, has simpler questions to answer, fewer spelling words, etc. ● Provide models of completed homework assignments, projects, etc. ● Assign a native language partner. ● Use sentence/paragraph frames to assist with writing peer review. ● Provide extended time for written responses and reports.	● Use scaffolds, such as prompting to assist with the design process. ● Provide extended time for written responses and reports. ● Use a graphic organizer to categorize concepts. ● Get a written list of instructions ● Receive large project as smaller tasks with individual deadlines ● Work or take a test in a different setting, such as a quiet room with few distractions ● Sit where they learn best (for example, near the teacher) ● Use an alarm to help with time management ● Work with a partner	● Use a graphic organizer to categorize concepts. ● Provide an outline for research and design tasks. ● Provide extended time for written responses and reports. ● Incorporate student choice ● Provide peer mentoring to improve techniques ● Use effort and achievement rubrics ● Assure students they can be successful ● Promote mastery or challenging tasks ● Allow students many opportunities for practice and learning ● Use scaffolding for complex tasks	● Take on an additional or more complex crime scene challenge. ● Interview someone in the field of forensic science about how they use the analysis in their profession. ● Offer choices, once finished with a basic task, with personal interest being the key.

		• Evaluate students on the basis of mastery and not one another.	

Forensic Science
Unit 11: Ballistics, Firearms and Tool Marks
Time Allotted: Approximately 1-2 Weeks
New Jersey Student Learning Standards (NJSLS)
HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **HS-PS2-6** Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
Asking Questions and Defining Problems • Analyze complex real-world problems by specifying criteria and constraints for successful solutions. **Engaging in Argument from Evidence** • Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. - *Connections to Nature of Science* **Scientific Knowledge is Open to Revision in Light of New Evidence** • Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation.	**ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. **LS2.C: Ecosystem Dynamics, Functioning, and Resilience** • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.	**Stability and Change** • Much of science deals with constructing explanations of how things change and how they remain stable. - *Connections to Engineering, Technology, and Applications of Science* **Influence of Science, Engineering, and Technology on Society and the Natural World** • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)
• How do forensic scientists analyze bullets? • How are different types of firearms that are analyzed by forensic	**The students will be able to**: • Examine and identify different types of bullets and cartridges • Measure the caliber of bullets	**Laboratory Investigations**: *Application of Scientific and technical skills as well as Inquiry investigation where students will analyze data and construct claims:*	**Formative and Summative**: • Examining and identifying different types of bullets and cartridges

scientists? ● How can bullets be used to reconstruct a crime scene? ● When and how are tool marks examined by a forensic scientist?	and bullet holes ● Research the different types of firearms that are seen at crime scenes ● Calculate angle and point of origin of a bullet trajectory ● Analyze the rifling of crime scene gun barrels and determine which was the one that fired the shot based on the bullets found ● Examine and recreate various tool marks and use to interpret the mark found at the crime scene	● Bullet Analysis Lab: Students observe, compare, measure and record different types of bullets. ● Cartridge Analysis Lab: Students observe, compare, measure and record different types of cartridge cases ● Ballistics Lab: Students analyze the rifling of crime scene gun barrels and identify the direction and number of lands and grooves.Then determine the type of bullet that may have been fired from the gun of that barrel based on the bullets found. ● Gunshot Distance Lab: Students analyze and measure the patterns from shots fired from at different distances. ● Tool Mark Analysis Lab: Examine and recreate various tool marks and use to interpret which screw driver could have made the mark found at the crime scene	● Measuring the caliber of bullets and bullet holes ● Researching the different types of firearms that are seen at crime scenes ● Calculating angle and point of origin of a bullet trajectory ● Analyzing the rifling of crime scene gun barrels and determining which was the one that fired the shot based on the bullets found ● Examining and recreating various tool marks and use to interpret the mark found at the crime scene ● Demonstrate mastery through: ○ Summative Assessments ○ Laboratory activities ○ Class participation
Resources/Materials	● Spent bullets and cartridges, Inert Bullets, Dissecting scopes and hand lenses ● Calipers and protractors, projectile rods, tape measures ● Foam boards with gunshot holes made at varying distances ● Various tools to make marks: screw drivers, wrenches, hammers		
ELA Companion Standards	**RST.11-12.1**: Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. **RST.11-12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.9:** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **WHST.9-12.1**: Write arguments focused on discipline-specific content. **WHST.9-12.2**: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research		
Interdisciplinary Connections	***Connections to NJSLS – English Language Arts*:**		

	SL.11-12.1. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. **SL.11-12.4** Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate ***Connections to NJSLS – Mathematics:*** **MP.2**: Reason abstractly and quantitatively **MP.4:** Model with mathematics. **HSN-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. **HSN-Q.A.2:** Define appropriate quantities for the purpose of descriptive modeling. **HSS-ID.A.1:** Represent data with plots on the real number line. **HSS-IC.B.6:** Evaluate reports based on data
Career Readiness, Life Literacies and Key Skills	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs **9.2.12.CAP.6:** Identify transferable skills in career choices and design alternative career plans based on those skills. **9.2.12.CAP.7**: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest. **9.2.12.CAP.8**: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **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). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices** Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively. Work productively in teams while using cultural/global competence.
Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.1.12.DA.6:** Create and refine computational models to better represent relationships among different elements of data collected from a phenomena or process.

	8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).

Modifications

Multi-Lingual Learners	Special Education	At-Risk	Gifted and Talented
• When possible, modify assignments so the student writes less, has simpler questions to answer, fewer spelling words, etc. • Provide models of completed homework assignments, projects, etc. • Assign a native language partner. • Use sentence/paragraph frames to assist with writing peer review. • Provide extended time for written responses and reports.	• Provide additional time for project development. • Work with a peer • Break the assignment into smaller pieces. • Utilize graphics to support learning. • Provide an outline of lessons • Get a written list of instructions • Receive large project as smaller tasks with individual deadlines • Work or take a test in a different setting, such as a quiet room with few distractions • Sit where they learn best (for example, near the teacher)	• Break the design process into smaller pieces. • Conference with the teacher during the process. • Provide a detailed framework for the project design. • Incorporate student choice • Provide peer mentoring to improve techniques • Use effort and achievement rubrics • Assure students they can be successful • Promote mastery or challenging tasks • Allow students many opportunities for practice and learning • Use scaffolding for complex tasks • Evaluate students on the basis of mastery and not one another.	• Offer choices, once finished with a basic task, with personal interest being the key. • Develop and research both individually and in collaboration with peers.

Forensic Science

Unit 12: Document Analysis

Time Allotted: Approximately 1 Week

New Jersey Student Learning Standards (NJSLS)

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-PS2-6 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
Asking Questions and Defining Problems • Analyze complex real-world problems by specifying criteria and constraints for successful solutions. **Engaging in Argument from Evidence** • Evaluate the claims, evidence, and reasoning behind currently accepted explanations or	**ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.	**Stability and Change** • Much of science deals with constructing explanations of how things change and how they remain stable. -

solutions to determine the merits of arguments. - *Connections to Nature of Science* **Scientific Knowledge is Open to Revision in Light of New Evidence** • Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation.	• Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. **LS2.C: Ecosystem Dynamics, Functioning, and Resilience** • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.	*Connections to Engineering, Technology, and Applications of Science* **Influence of Science, Engineering, and Technology on Society and the Natural World** • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)

• How can class and individual characteristics of handwriting be used to identify a suspect?
• How are chemical and physical tests used to distinguish paper and ink from each other?
	The students will be able to::
	• Identify an individual by their handwriting
	• Distinguish different types of ink and paper
		Laboratory Investigations:
		Inquiry investigation where students will analyze data and construct claims:
		• Document Analysis Lab: Students analyze handwriting, paper, ink, erasures, obliterations, and indented writing to determine if a document was forged.
		• Ink Chromatography: Students will conduct paper chromatography on different types of black ink to determine which suspect left a threatening note at a crime scene
		• Art Forgery Lab Kit: Students test "artwork" for evidence of forgery.
			Formative and Summative:
			• Analyzing and comparing different types of ink and paper
			• Paper Chromatograms of different types of black ink
			• Analyzing handwriting to identify an individual
			• Demonstrate mastery through:
			  ○ Summative Assessments
			  ○ Laboratory activities

Resources/Materials	• Several different types of water soluble black markers and chromatography paper • Ink, paper, and handwriting samples • Flinn Art Forgery Lab		
ELA Companion Standards	**RST.11-12.1**: Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. **RST.11-12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.		

	RST.11-12.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.9:** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **WHST.9-12.1**: Write arguments focused on discipline-specific content. **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research
Interdisciplinary Connections	***Connections to NJSLS – English Language Arts*:** **SL.11-12.1**. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. **SL.11-12.4** Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate ***Connections to NJSLS – Mathematics*:** **MP.2**: Reason abstractly and quantitatively **MP.4:** Model with mathematics. **HSN-Q.A.2:** Define appropriate quantities for the purpose of descriptive modeling. **HSS-IC.B.6:** Evaluate reports based on data
Career Readiness, Life Literacies and Key Skills	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs **9.2.12.CAP.6:** Identify transferable skills in career choices and design alternative career plans based on those skills. **9.2.12.CAP.7**: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest. **9.2.12.CAP.8**: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **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). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices** Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively.

	Work productively in teams while using cultural/global competence.
Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.1.12.DA.6:** Create and refine computational models to better represent relationships among different elements of data collected from a phenomena or process. **8.2.12.ED.5:** Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).

Modifications

Multi-Lingual Learners	Special Education	At-Risk	Gifted and Talented
● When possible, modify assignments so the student writes less, has simpler questions to answer, fewer spelling words, etc. ● Provide models of completed homework assignments, projects, etc. ● Assign a native language partner. ● Use sentence/paragraph frames to assist with writing peer review. ● Provide extended time for written responses and reports.	● Use scaffolds, such as prompting to assist with the design process. ● Provide extended time for written responses and reports. ● Use a graphic organizer to categorize concepts. ● Get a written list of instructions ● Receive large project as smaller tasks with individual deadlines ● Work or take a test in a different setting, such as a quiet room with few distractions ● Sit where they learn best (for example, near the teacher) ● Use an alarm to help with time management ● Work with a partner	● Use a graphic organizer to categorize concepts. ● Provide an outline for research and design tasks. ● Provide extended time for written responses and reports. ● Incorporate student choice ● Provide peer mentoring to improve techniques. ● Use effort and achievement rubrics ● Assure students they can be successful. ● Allow students many opportunities for practice and learning ● Use scaffolding for complex tasks ● Evaluate students on the basis of mastery and not one another.	● Take on an additional or more complex crime scene challenge. ● Interview someone in the field of forensic science about how they use the analysis in their profession. ● Offer choices, once finished with a basic task, with personal interest being the key.

Forensic Science

Unit 13: Human Remains

Time Allotted: Approximately 5-6 Weeks

New Jersey Student Learning Standards (NJSLS)

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS1-6 Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon based molecules.

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts

Asking Questions and Defining Problems
- Analyze complex real-world problems by specifying criteria and constraints for successful solutions.

Developing and Using Models Modeling
- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.

Planning and Carrying Out Investigations
- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

Constructing Explanations and Designing Solutions
- Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

ETS1.A: Defining and Delimiting Engineering Problems
- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.
- Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.

LS1.A: Structure and Function
- Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system.
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.

LS1.C: Organization for Matter and Energy Flow in Organisms
- The sugar molecules thus formed contain carbon, hydrogen, and oxygen: their hydrocarbon backbones are used to make amino acids and other carbon-based molecules that can be assembled into larger molecules (such as proteins or DNA), used for example to form new cells.
- As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.

Stability and Change
- Feedback (negative or positive) can stabilize or destabilize a system.

Systems and System Models
- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows— within and between systems at different scales

Energy and Matter
- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Connections to Engineering, Technology, and Applications of Science

Influence of Science, Engineering, and Technology on Society and the Natural World
- New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)
• How do forensic anthropologists analyze skeletal remains? • How do forensic pathologists determine the cause and manner of death? • What happens during an autopsy? • How does a forensic entomologist calculate the post-mortem interval?	**The students will be able to** • Measure and analyze the physical characteristics of skulls, hips and long bones • Interpret the measurements of crime scene bones to determine the identity of the victim • Measure and calculate PMI of several descendents using insect	**Laboratory Investigations:** *Application of Scientific and technical skills as well as Inquiry investigation where students will analyze data and construct claims:* • No Bones About It Lab: Students measure their actual height and compare this height to the calculated height using the lengths of their humerus and femur.	**Formative and Summative:** • Measuring and analyzing the physical characteristics of skulls, hips and long bones • Interpreting the measurements of crime scene bones to determine the identity of the victim • Measuring and calculating PMI of several descendents using insect

• Why are insects used by forensic scientists?
• What kinds of information can be found from examining the stomach contents of the decedent?
• How does an odontologist examine teeth and what kinds of information can be derived?
	larvae
	• Describe how a pathologist would perform an autopsy
	• Explain how a body would decompose
	• Analyze the stomach contents and bodily fluids of the decedent and determine cause of death
	• Examine teeth impressions for determining the identification of remains
		• Sherlock Bones Lab: Students measure and record characteristics of skull, pelvis, humerus and femur. Comparing characteristics of age, sex, height, race. Using data determine this information for crime scene skeleton
		• Of Maggots and Murder Entomology Lab; Students measure lengths of "pipe cleaner" maggots and using data from entomolgist chart determine the post mortem interval of 4 different crime scenes
		• Preserved Maggots Mini Lab: Students observe preserved maggots, measure and record. Determine PMI
		• Interactive Autopsy Lab: https://www.le.ac.uk/pa/teach/va/titlpag1.htmlstudents investigate different cases and based on the data determine the cause of death.
		• Murder and Meal Lab: Students investigate the "stomach contents" of decedant by performing biochemical tests and based on these results determine where the decedent might have eaten their last meal.
		• Coroner's Report Lab- simulated blood and urine is used and analyzed performing biochemical tests. Students use this data to determine how the decedent could have died.
		• Odontology Lab- Students use styrofoam cups or sticks of gum to make teeth impressions. They observe and record data. Then students create crime scenes where one the impressions are used and must be analyzed.
			larvae
			• Describing how a pathologist would perform an autopsy
			• Explaining how a body would decompose
			• Analyzing the stomach contents and bodily fluids of the decedent and determine cause of death
			• Examining teeth impressions for determining the identification of remains
			• Demonstrate mastery through:
			  ○ Tests/Quizzes
			  ○ Laboratory activities
			  ○ Class participation

Resources/Materials	• Skeleton parts: Skulls of different sex and race, female and male hips, femurs, humerus bones • Calipers, protractors, • "Stomach contents", biochemical indicators, artificial blood and urine • Pipe cleaners cut to different sizes to represent maggots of different ages, small rulers, maggot temp chart • Styrofoam cups or sticks of gum • https://www.le.ac.uk/pa/teach/va/titlpag1.html for virtual autopsy		
ELA Companion Standards	**RST.11-12.1**: Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. **RST.11-12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.9:** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **WHST.9-12.1**: Write arguments focused on discipline-specific content. **WHST.9-12.2**: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research		
Interdisciplinary Connections	***Connections to NJSLS – English Language Arts*:** **SL.11-12.1**. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. **SL.11-12.4** Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate ***Connections to NJSLS – Mathematics:*** **MP.2**: Reason abstractly and quantitatively **MP.4:** Model with mathematics. **HSN-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. **HSN-Q.A.2:** Define appropriate quantities for the purpose of descriptive modeling. **HSS-ID.A.1:** Represent data with plots on the real number line. **HSS-IC.B.6:** Evaluate reports based on data		
Career Readiness, Life Literacies and Key	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences,		

Skills	apprenticeships, and dual enrollment programs **9.2.12.CAP.6:** Identify transferable skills in career choices and design alternative career plans based on those skills. **9.2.12.CAP.7**: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest. **9.2.12.CAP.8**: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **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). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices** Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively. Work productively in teams while using cultural/global competence.
Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.1.12.DA.6:** Create and refine computational models to better represent relationships among different elements of data collected from a phenomena or process. **8.2.12.ED.5:** Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).

Modifications

Multi-Lingual Learners	Special Education	At-Risk	Gifted and Talented
● When possible, modify assignments so the student writes less, has simpler questions to answer, fewer spelling words, etc. ● Provide models of completed homework assignments, projects, etc. ● Assign a native language partner. ● Use sentence/paragraph frames to assist with writing peer review. ● Provide extended time for written responses and reports.	● Provide additional time for project development. ● Work with a peer ● Break the assignment into smaller pieces. ● Utilize graphics to support learning. ● Provide an outline of lessons ● Get a written list of instructions ● Receive large project as smaller tasks with individual deadlines ● Work or take a test in a different setting, such as a quiet room with few distractions ● Sit where they learn best (for example, near the teacher)	● Break the design process into smaller pieces. ● Conference with the teacher during the process. ● Provide a detailed framework for the project design. ● Incorporate student choice ● Provide peer mentoring to improve techniques ● Use effort and achievement rubrics ● Assure students they can be successful ● Promote mastery or challenging tasks ● Allow students many opportunities	● Offer choices, once finished with a basic task, with personal interest being the key. ● Develop and research both individually and in collaboration with peers.

		for practice and learning • Use scaffolding for complex tasks • Evaluate students on the basis of mastery and not one another.	

Forensic Science

Unit 14: Forensic Psychology

Time Allotted: Approximately 2-3 Weeks

New Jersey Student Learning Standards (NJSLS)

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
HS-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
Asking Questions and Defining Problems • Analyze complex real-world problems by specifying criteria and constraints for successful solutions. **Developing and Using Models Modeling** • Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. **Planning and Carrying Out Investigations** • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.	**ETS1.A: Defining and Delimiting Engineering Problems** • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. • Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. **LS1.A: Structure and Function** • Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. • Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.	**Stability and Change** • Feedback (negative or positive) can stabilize or destabilize a system. **Systems and System Models** • Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows— within and between systems at different scales - *Connections to Engineering, Technology, and Applications of Science* **Influence of Science, Engineering, and Technology on Society and the Natural World** • New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.

Essential Questions	Student Learning Objectives	Suggested Tasks/Activities	Evidence of Learning (Assessment)

● Why do people engage in criminal behaviors? ● Are serial killers born or made?	**<u>The students will be able to</u>**: ● Explain why people engage in criminal behaviors ● Analyze the components of the MacDonald Triad	**<u>Laboratory Investigations:</u>** *Effective Communication Skills*: ● <u>Serial Killer Friday</u>: Students will examine the field of forensic psychology by attempting to understand the minds of some of the world's most twisted individuals... serial killers. Students will research and present information about a serial killer of their choice and will attempt to explain why they committed the acts they did.	**<u>Formative and Summative:</u>** ● Research and present the life and crimes of a serial killer ● Demonstrate mastery through: ○ Class participation ○ Presentation
Resources/Materials	- Presentation Technology:Keynote, Google Presentation,PowerPoint - https://murderpedia.org/ - https://www.fbi.gov/history/famous-cases		
ELA Companion Standards	**RST.11-12.1**: Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions. **RST.11-12.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.11-12.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.9:** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **WHST.9-12.1**: Write arguments focused on discipline-specific content. **WHST.9-12.2**: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes **WHST.9-12.7:** Conduct short as well as more sustained research projects to answer a question (including a self generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. **WHST.9-12.9**: Draw evidence from informational texts to support analysis, reflection, and research		
Interdisciplinary Connections	***<u>Connections to NJSLS – English Language Arts</u>*:** **SL.11-12.1**. Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.11-12.2**. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively, orally) evaluating the credibility and accuracy of each source. **SL.11-12.4** Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. **SL.11-12.5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. **SL.11-12.6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate		

	Connections to NJSLS – Mathematics: **MP.2**: Reason abstractly and quantitatively **HSS-IC.B.6:** Evaluate reports based on data
Career Readiness, Life Literacies and Key Skills	**9.2.12.CAP.2:** Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs **9.2.12.CAP.7**: Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest. **9.2.12.CAP.8**: Determine job entrance criteria (e.g., education credentials, math/writing/reading comprehension tests, drug tests) used by employers in various industry sectors. **9.4.12.CI.1:** Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). **9.4.12.CI.3:** Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). **Career Readiness, Life Literacies, and Key Skills Practices** Act as a responsible and contributing community member and employee Demonstrate creativity and innovation. Utilize critical thinking to make sense of problems and persevere in solving them. Model integrity, ethical leadership, and effective management. Plan education and career paths aligned to personal goals. Use technology to enhance productivity, increase collaboration, and communicate effectively. Work productively in teams while using cultural/global competence.
Computer Science & Design Thinking	**8.1.12.DA.5:** Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena. **8.2.12.ETW.4:** Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.

Modifications

Multi-Lingual Learners	Special Education	At-Risk	Gifted and Talented
● When possible, modify assignments so the student writes less, has simpler questions to answer, fewer spelling words, etc. ● Provide models of completed homework assignments, projects, etc. ● Assign a native language partner. ● Use sentence/paragraph frames to assist with writing peer review. ● Provide extended time for written responses and reports.	● Use scaffolds, such as prompting to assist with the design process. ● Provide extended time for written responses and reports. ● Use a graphic organizer to categorize concepts. ● Get a written list of instructions ● Receive large project as smaller tasks with individual deadlines ● Work or take a test in a different setting, such as a quiet room with few distractions ● Sit where they learn best (for example, near the teacher) ● Use an alarm to help with time	● Use a graphic organizer to categorize concepts. ● Provide an outline for research and design tasks. ● Provide extended time for written responses and reports. ● Incorporate student choice ● Provide peer mentoring to improve techniques ● Use effort and achievement rubrics ● Assure students they can be successful ● Promote mastery or challenging tasks ● Allow students many opportunities	● Take on an additional or more complex crime scene challenge. ● Interview someone in the field of forensic science about how they use the analysis in their profession. ● Offer choices, once finished with a basic task, with personal interest being the key.

	management ● Work with a partner	for practice and learning ● Use scaffolding for complex tasks ● Evaluate students on the basis of mastery and not one another.	

Additional Resources to promote DEI:

- Structure Matters: Twenty-One Teaching Strategies to Promote Student Engagement and Cultivate Classroom Equity
- Race Matters
- Inclusive Teaching