DNA

Content Area: **Science**
Course(s): **Introduction to Forensic Investigations**
Time Period: **Second Marking period**
Length: **4 Weeks**
Status: **Published**

Unit Overview

This unit involves the study of the role of DNA in Forensic Science. Though the discovery of DNA has been important in all major fields of Forensic Science, it has been notably important to the field of Forensic Science. The discovery of DNA has meant that the guilt or innocence of a person who is investigated for a crime can be determined. It also means that scarce evidence can still yield vital clues regarding the perpetrator of a crime. Also important is that the identification of victims can occur, particularly in cases where the victim's condition is unrecognisable to family or friends. In this sense, students are made aware of the importance of DNA in revolutionising the entire field of Forensic Science.

STAGE 1- DESIRED RESULTS

Standards- 2020 New Jersey Student Learning Standards- Science

SCI.9-12.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.
SCI.9-12.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Science and Engineering Practices

- Analyzing and Interpreting Data
- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Developing and Using Models
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information
- Planning and Carrying Out Information
- Using Mathematics and Computational Thinking

Cross Cutting Concepts

- Cause and Effect
- Energy and Matter
- Influence of Engineering, Technology, and Science on Society and the Natural World
- Interdependence of Science, Engineering, and Technology
- Patterns
- Scale, Proportion, and Quantity
- Stability and Change
- Structure and Functions
- Systems and System Models

Disciplinary Core Ideas

Physical Sciences

- PS1B: Chemical Reactions
- PS2A: Forces and Motion

Life Sciences

- LS1A: Structure and Functions
- LS1D: Information Processing
- LS3A: Inheritance of Traits
- LS3B: Variation of traits
- LS4A: Evidence of Common Ancestry and Diversity

Earth and Space Sciences

Engineering. Technology. and Applications of Science

- ETS1B: Developing Possible Solutioins
- ETS1C: Optimizing the Design Solution

Essential Questions

- What is the value of DNA as evidence ?
- How is DNA extracted and characterized ?
- How can DNA be analyzed to make connections between crime scenes and suspects ?

Enduring Understanding

- The DNA sequence of every organism is unique.
- DNA technology allows scientists to manipulate and analyze DNA in order to make connections between crime scenes and suspects.

Students will know…

Vocabulary - allele, chromosome, CODIS, DNA fingerprint, electrophoresis, exon, gene, genome, intron, karyotpe, PCR, polymorphism, primer, restriction enzyme, restriction fragment, STR

Misconceptions - twins have different DNA, DNA only comes from blood

Students will be able to…

- Identify the characterisitcs of DNA that is most useful in forensic comparisons.
- Demonstrate procedures used by the forensic scientist when processing DNA evidence.
- Explain the importance of DNA databases available to forensic scientists.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment

- 3- Minute Pause

- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Index Card Summaries
- Journal Entry
- Misconception Check
- Observation
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

Authentic Assessments

- Written tests and quizzes
- Worksheets
- Lab/Activity
- Project Assessments
- Research Activities
- Webquests such as: www.pbs.org/wgbh/nova/shepard/labwave.html(make a DNA profile)
- Research activites such as identification of remains from the World Trade Center, Hurricane Katrina, tsunami etc.
- Research activities such as projectinnocence.com or pbs.org ("Justice Delayed") or sciencespot.net
- Famous Case Study to research such as: The Green River Killer (Gary Rideway)
- Wequests such as: "Virtual DNA extracton" http://learn.genetics.utah.edu/content/labs/extraction

Benchmark Assessments

Chapter test on Structure of DNA

Chapter test on DNA analysis

STAGE 3- LEARNING PLAN

Instructional Map

- Textbook: Forensic Science: Fundamentals and Investigations. 2nd edition by Bertino and Bertino. Publishers: Cengage Learning, 2016
- Notes, Handouts
- Laboratory tools
- Appropriate hands-on materials
- Create a model of DNA
- Isolation of DNA from liver, onion, strawberries, banana etc.

Modification/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means

- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Cooperative Grouping
- Extended Time
- Frequent Breaks
- Highlighted Text
- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-direct
- Repeated Drill and Practice
- Teacher Notes
- Tutorials
- Use of Additional Reference Materials
- Use of Audio Resources

Differentiation Strategies

High Preparation

- Alternative Assessments

- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Leveled Rubrics
- Multiple Texts
- Project Based Learning (PBL)
- Stations / Centers
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation

- Choice of Book / Activity
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Open-ended Activities
- Think-Pair-Share by Readiness, Interest, or Learning Style
- Use of Collaboration
- Use of Reading Buddies
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Intergration- Interdisciplinary Connections

See Appendix

Vertical Integration- Discipline Mapping

Middle School - Diversity of Life, Populations and Ecosystems, Human Systems Interactions, and Heredity and Adaptations

High School Biology - DNA extraction, function, protein synthesis.

High School Anatomy/Zoology/Chemistry

Additional Materials

- Paper Helix Activity - templates, construction paper, scissors, tape
- "The Case of the Crown Jewels" Activity
- DNA Extraction Lab materials (salt water, dish detergent, ethanol, test tubes)
- Lab Analysis Questions
- Teacher observations
- Poster of a DNA fingerprint