Unit 2 - Forensic Toxicology and Blood (DNA and Identification)

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Belleville Public Schools

Curriculum Guide

Unit 2 - Forensic Science

Forensic Toxicology and Blood (DNA and Drug Identification)

Belleville Board of Education

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Unit Overview

This unit is an introduction to biotechnology and the biotechnology used in forensic science to detect micro molecules. Students will be introduced to drug classes of commonly abused drugs and detection methodologies. In addition students will learn about the biotechnology associated with blood trace evidence and DNA.

Enduring Understanding

1. All medications are divided and classified according to their influence and effect on the body and their chemical make-up.
2. There are certain medications that have been controlled specifically because of their effect on human physiology and rate of

potential dependence these are referred to as controlled substances.
3. The US has developed laws to control susbtances that are known or are prone to being abused.
4. Field tests along with developed laboratory protocols have been developed to determine the type of drug and relative concentration.
5. There are specific policies and procedures that are used in the collection and preservation of drug evidence.
6. Medications at different doses are toxic to humans and may play a role in injury and death.
7. Toxicology is used to determine the rate, ratio, and dose of toxins that are introduced to a person.
8. The compositions of blood and function of blood cells and semen are used in forensic science to identify persons.
9. There is a procedure in the collection of evidence in cases specifically to preserve and maintain DNA analysis.
10. DNA is used to identify and exclude individuals of interest in criminal cases
11. Over the last years there has been development of databases with individuals' DNA.
12. Blood spatter can also be used for analysis in crime scene reconstruction.

Essential Questions

1. What are the psychological and physical effects of drugs?
2. What are the different types of controlled substances?
3. What are the signs and symptoms of a drug overdose?
4. What type of toxins can cause death?
5. What are some of the different agents that can be used in bioterrorism?
6. How is blood typing used to identify an individual?
7. What laboratory tests are used to characterize blood and semen?
8. What is included in a rape kit?
9. Explain the double-helix structure of DNA?
10. How are computerized DNA databases used in criminal investigation?
11. How is DNA evidence obtained and extracted?
12. How is DNA analysis used to identify or exclude and individual from a criminal investigation?
13. How to examine blood spatter and determine the nature of the weapon?
14. How is bloodstain pattern analysis used to recreate events involved in a violent crime?

Exit Skills

- Students will know: The different types of controlled substances. The psychological and physical dependences of drugs. The field and laboratory tests used in drug identification analysis. The proper collection and preservation of drug evidence. The techniques used to isolate and identify drugs and poisons. The signs and symptoms of overdose with specific class of drugs and toxins. Describe agents that may be used in bioterrorism.
- Students will know: The composition of blood and the function of blood cells. How blood is typed. The forensic tests used to characterize a stain as blood. How to use a Punnett square to determine genotype and phenotype. The proper collection of physical evidence in a rape

investigation. The parts of a nucleotide and how they are linked to form DNA. The concept of base pairing as it relates to the double-helix. How crime scene evidence is collected and processed for DNA analysis. How DNA fingerprinting is compared for matching. How DNA fingerprinting is used to identify or exclude individuals in an investigation. The procedure for proper preservation of biological evidence for DNA analysis. The information that can be gained from bloodstain pattern analysis about events involved in a violent crime. How blood pattern types are created and which features of each pattern can be used to aid in reconstructing events at a crime scene.

- Identifying and classifying the different types of commonly abused drugs
- Describing the field and laboratory tests used to identify drugs.
- Understanding the proper collection and preservation of drug evidence.
- Describing the techniques used by forensic scientists to isolate and identify drugs and poisons.
- Relating the signs and symptoms of an overdose with a specific class of drugs or toxins.
- Defining the goals and practices of toxicology.
- Identifying the composition of blood. Blood typing.
- Understanding the forensic tests used to characterize a stain as blood or semen.
- Using Punnett squares to determine genotype and phenotype.
- Describing the proper collection of rape evidence.
- Explain how DNA evidence is collected and processed for DNA analysis.
- Explain how DNA analysis can be used to identify or exclude an individual from a criminal investigation.
- Understanding the use of DNA databases in criminal investigations.
- Calculating angle of impact from blood spatter analysis.
- Determine the area of convergence and point of origin from blood spatter analysis.
- Use blood spatter evidence to recreate the events at a crime scene.

New Jersey Student Learning Standards (NJSLS-S)

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-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
LA.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.
LA.RST.11-12.2	Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

LA.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Interdisciplinary Connections

LA.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.
LA.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.
LA.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.
LA.WHST.11-12.1.A	Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
MA.A-CED.A.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
LA.WHST.11-12.1.B	Develop claim(s) and counterclaims using sound reasoning and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
LA.WHST.11-12.1.C	Use transitions (e.g., words, phrases, clauses) to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
MA.A-CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
LA.WHST.11-12.1.D	Establish and maintain a style and tone appropriate to the audience and purpose (e.g., formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing.
LA.WHST.11-12.1.E	Provide a concluding paragraph or section that supports the argument presented.

Learning Objectives

1. Explain the composition of blood and describe the function of blood cells.
2. List the A-B-O antigens and antibodies found in blood for the four blood types and describe how blood is typed.
3. List and describe forensic tests used to characterize a stain as blood or semen.
4. Describe the proper collection of physical evidence in a rape investigation.
5. Explain how crime scene evidence is collected and processed for DNA analysis.
6. Name the parts of a nucleotide and explain how they are linked to form DNA.
7. Understand the concept of base pairing as it relates to the double-helix structure of DNA.
8. Explain how DNA typing is used to identify and exclude individuals.
9. Understand the use of DNA computerized databases in criminal investigation.
10. Discuss the information that can be gained from bloodstain pattern analysis about the events in a

violent crime.

11. Explain how surface texture, directionality and angle of impact affect the shape of individual bloodstains.
12. Describe the different classifications of low, medium and high velocity impact spatter.
13. Discuss the methods to determine the area of convergence and the area of origin for impact spatter patterns.
14. Use blood spatter evidence to recreate the events at a crime scene.

Suggested Activities & Best Practices

1. Use of Opening Scenarios
2. Use of Phenomenon Based Learning
3. Debates
4. Capstone Projects
5. End of Chapter Activities
6. Kinesthetic Learning Activity
7. Pre-writing and Writing Activities

Assessment Evidence - Checking for Understanding (CFU)

Chapter Quizzes and Tests (Summative)

Socratic Questioning (Formative)

Lab Journal (Alternative)

Common Department Benchmark (Benchmark)

Oncourse Assessment Tools (Formative)

Do Now and Exit Tickets (Formative)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

Forensic Science: Fundamentals and Investigations- new 3 rd edition authors: Bertino & Bertino Publisher: National Geographic Learning/Cengage 7.12.20

Ancillary Resources

Teacher and Publisher supplied power points, notes, guides, labs, and worksheets

Resource manuals

Internet Resources

Computer Activities

Technology Infusion

Gizmos

Near POD

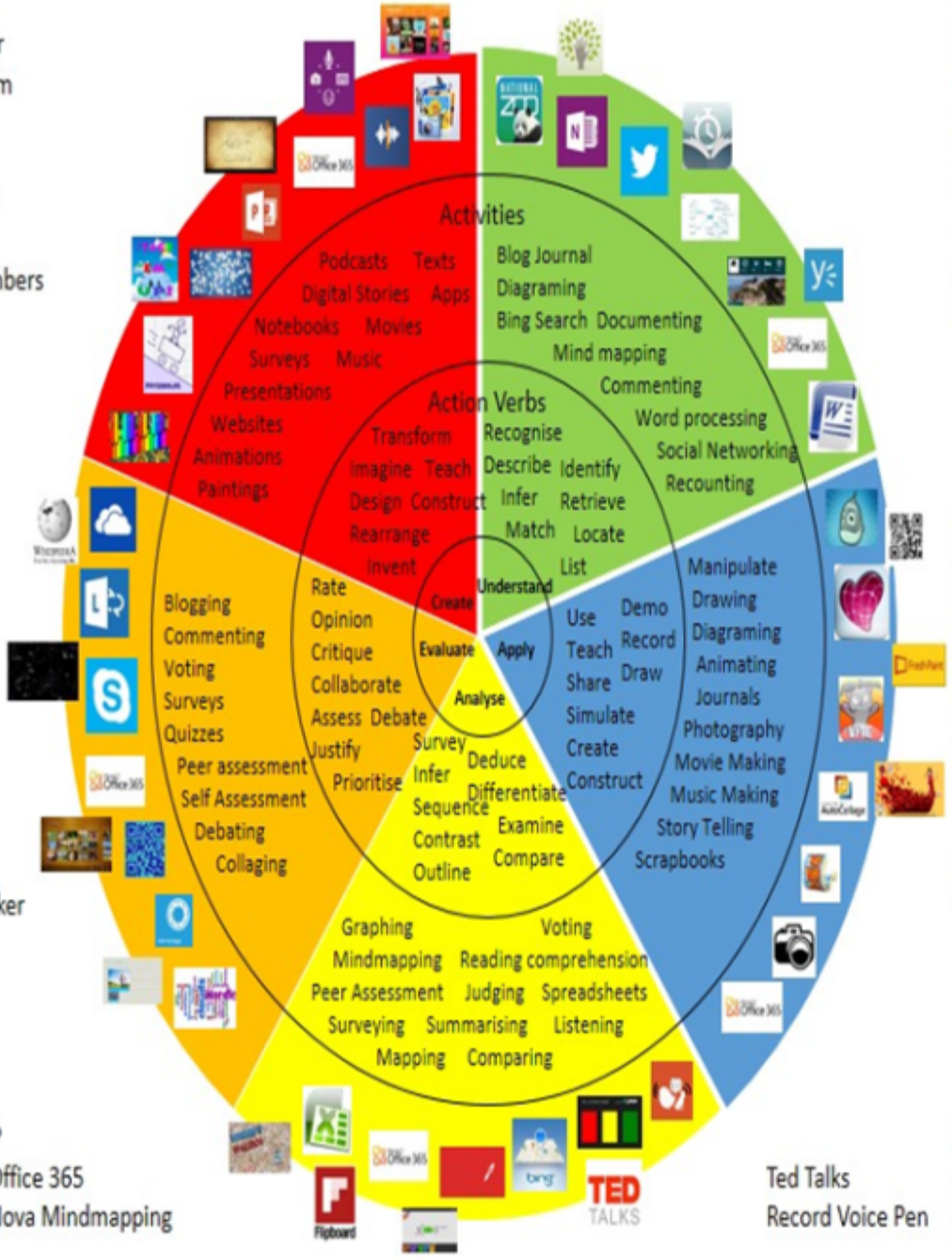
Google Classroom

JamBoards

Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker



Where's Waldo?
MS Excel Office 365
Flipboard Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

Alignment to 21st Century Skills & Technology

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
CAEP.9.2.12.C.4	Analyze how economic conditions and societal changes influence employment trends and future education.
CAEP.9.2.12.C.5	Research career opportunities in the United States and abroad that require knowledge of world languages and diverse cultures.
CAEP.9.2.12.C.6	Investigate entrepreneurship opportunities as options for career planning and identify the knowledge, skills, abilities, and resources required for owning and managing a business.
CAEP.9.2.12.C.7	Examine the professional, legal, and ethical responsibilities for both employers and employees in the global workplace.

TECH.8.1.12.A.3	Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
TECH.8.1.12.A.4	Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
TECH.8.1.12.A.5	Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
TECH.8.1.12.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.
TECH.8.1.12.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.12.C.CS3	Develop cultural understanding and global awareness by engaging with learners of other cultures.
TECH.8.1.12.C.CS4	Contribute to project teams to produce original works or solve problems.

21st Century Skills/Interdisciplinary Themes

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

21st Century Skills

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

Differentiation

Small Group Instruction

Study Guides

Project Based Learning

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects

- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

Special Education Learning (IEP's & 504's)

Quiz and Test Study Guides

Graphic Organizers

Powerpoints posted on google classroom

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan

- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation
- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

Peer to assist students

Allow tests and quizzes to be taken in ESL room with extra time

Students allowed to use electronic devices for translation

Word Lists provided

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required

- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

At Risk

Provide modified test

Tutoring times offered

Allow students to correct test for partial credit

Extended time for assignments

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Talented and Gifted Learning (T&G)

Provide enrichment articles and assignments

Allow students to complete independent study assignments

- Above grade level placement option for qualified students
- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge