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|  Prepared By: Maureen DeLacy Subject: Criminal Justice Date: April 11, 2023 Grade Level: 9 - 12  Learning Goals: Understand that crime scenes can be reconstructed using blood stain patterns. Understand that blood stain patterns are affected by height, speed, and angle of impact. Identify the angle of impact of blood droplets by their shape, length and width.  Analyze and compare blood droplets and patterns and draw conclusions about the height, speed and angle of impact from the blood source. Identify the type of impact that created the blood spatter including impacts from a gunshot, knife, baseball bat, blunt object or passive blood stains affected by gravity only. |
| What students will **Know**:Students will know that:* a grouping of blood stains produces a blood spatter pattern.
* blood sticks together as it falls maintaining a round shape.
* blood resists flattening out and maintains a curved shape when it falls on a flat surface.
* crime scenes can be reconstructed by measuring and analyzing blood stain patterns at the scene.
* the characteristics of blood stain patterns are based on the size and shape of the blood droplets.
* the shape of a blood drop is correlated to the velocity and angle of impact.
* blood that drops from a 90 degree angle will be circular in shape.
* when blood falls at a high velocity or high distance, it forms satellite droplets, small secondary droplets around the main drop.
* when blood falls onto a less-than-smooth surface, the edges may have spikes or extensions.
* by finding the area of convergence of the blood droplets, the point of origin for the source of the blood can be determined.
* the velocities when analyzing blood spatter: high, medium, and low velocity.
* the definition of **satellite** as the small droplets of blood that bread off from a parent stain
* the definition of **spike** or **spine** as the pointed edges of a blood droplet.
 | What students will **Understand**Students will understand that:* blood spatter analysis can help determine the direction, angle of impact, point of origin, and velocity of the blood; and the manner of injury or death.
* an elongated blood drop indicates the blood was traveling at an angle of less than 90 degrees when it landed.
* a blood droplet with a tail is pointing in the direction the blood was traveling.
* smaller droplets of blood may break off and land in front of a moving blood droplet indicating the direction of travel.
* scientists are able to determine where a bleeding person was located by using string and/or lasers that run through the long axis of at least two droplets to determine area of convergence.
* the types of blood patterns including smears, transfer patterns, swipes, wipes, cast off blood, and arterial gushes.
* to determine the origin of the blood, measure the long axis of two or more droplets.
* different types of impacts will result in different blood spatter patterns such as impacts from a gunshot, knife, baseball bat, blunt object, or passive blood stains caused by gravity.
* How to compare and contrast passive, low velocity and high velocity blood spatter blood droplets.
* the process for calculating the area of convergence of the blood spatter droplets.
* blood spatter analysis is a critical component of crime screen investigation.
* the proper techniques for creating blood spatter at predetermined heights, angles and speeds using tape measure, protractor, string and syringe.
* to correctly measure and analyze the blood spatter for comparison, measure the length and width of the parent droplet.
 | What students will **Do**:Students will be able to:* Demonstrate the proper technique for creating blood stains from predetermined heights, angles and speeds using a tape measure, protractor, string, and syringe.
* Create blood spatter patterns created from:
1. Passive blood droplets falling from 90 degrees at 1 foot, 3 feet, 6 feet
2. Medium velocity blood droplets expelled from 60 degrees, 45 degrees and 10 degrees.
3. Passive droplets while walking for ten feet.
4. Passive droplets while running for ten feet.
5. High velocity droplets from a 20 degree angle.
* Measure, record, and draw the sizes and shapes of blood spatter patterns created from:
1. Passive blood droplets falling from 90 degrees at 1 foot, 3 feet, 6 feet
2. Medium velocity blood droplets expelled from 60 degrees, 45 degrees and 10 degrees.
3. Passive droplets while walking for ten feet.
4. Passive droplets while running for ten feet.
5. High velocity droplets from a 20 degree angle.
* Analyze and compare the blood stains to determine any differences in size and shape.
* Distinguish between blood spatter that is passive, low impact, and high velocity by measuring the blood droplets.
* Analyze and compare the size and shape of blood stains to identify any correlation between the angles and speeds that the droplets were formed.
* Draw conclusions about the relationship between the size and shape of blood droplets and the angle and speed that the droplets are formed.
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|  **CTE Standards and Benchmarks:**

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| **01.0 Reading in Technical Subjects for student success in Criminal Justice Operations.****01.01.3 Key Ideas and Details:** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. **01.03.1 Integration of Knowledge and Ideas**: Translate quantitative or technical information expressed in words in a text into visual form (i.e. a table or chart) and translate information expressed visually or mathematically (e.g. in an equation) into words. |
| **02.0 Writing in Technical Subjects for student success in Criminal Justice Operations.****02.03.3 Research to Build and present Knowledge:** Draw evidence from information texts to support analysis, reflections, and research. |
| **03.0 Mathematical Practices in Technical Subjects for student success in Criminal Justice Operations.****03.02 Reason abstractly and quantitatively.****03.03 Construct viable arguments and critique the reasoning of others.****03.05 Use appropriate tools strategically.** |

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| **04.0 Identify the history, goals and career opportunities in the criminal justice system.****04.04 Identify the prerequisites for job entry into the criminal justice system.**  |
| **06.0 Discuss constitutional and criminal laws at the federal, state, and local levels.****06.06 Describe criminal law procedures in Florida.****17.0 Describe and demonstrate criminal investigation procedures.** **17.01 State the purpose and types of investigations.****17.02 Describe the responsibilities of law enforcement officers at the crime scene.****17.03 Describe the role of evidence in investigations.****17.04 Describe crime scene investigation procedures.** |
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| **Essential Questions:****Can I describe the relevant information that can be obtained about a crime scene using blood spatter analysis?**Can I describe the processes crime scene investigators use in reconstructing a crime scene using blood spatter analysis?Can I identify a tail, satellite and spike or spine of a blood droplet?Can I explain the steps to finding the area of convergence of blood spatter at a crime scene?Can I explain the proper technique for creating blood spatter using a tape measure, protractor, string and syringe with the following dimensions:* 90 degrees from heights of 1 foot, 3 feet, and 6 feet
* Medium velocity blood spatter at 60 degrees, 45 degrees and 10 degrees
* Falling blood drops while walking ten feet;
* Falling blood drops while running ten feet;
* High velocity blood spatter at 20 degrees with a syringe.

Can I explain and demonstrate a transfer blood stain? Can I describe the differences in the size and shape of blood droplets as they fall at angles less than 90 degrees?Can I explain how to analyze and compare blood stain patterns to determine the velocity and angle of impact of the blood?Can I explain the correlation between the size and shape of blood stains to the velocity and angle of impact of the blood? | Materials Needed * Fake Blood (Karo syrup, corn starch, food coloring & water)
* String
* Rulers
* Pencils
* Syringes
* Protractors
* Tape Measure
* White Sheets of Paper 6 feet
* Baby Wipes
* Nitrile Gloves
* Magnifying Glasses
* Student Lesson Plan
* Blood Spatter Recording Sheet
* List of Instructions for each team
* Video: Blood Spatter
* Blood Spatter Power Point
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| **Higher Order Thinking Questions for the Lesson:****Creating**: Can you create a real world situation where you would need to find the source of matter? What other situations can provide impressions that can be analyzed and compared?**Evaluating**: What was your thought processes when you measured, analyzed, and compared the blood spatter from each of the heights, speeds, and angles? Did you have enough information to draw any conclusions or find any correlation? Explain your reasoning.**Analyzing**: How did you use scientific methods to make any correlation between the size and shape of blood droplets to the velocity and angle of impact of the blood?**Applying**: What differences did you notice between the blood spatter created by walking and running? **Understanding**: (comprehension): What did you notice about the blood spatter that was cast at 10 degrees? And at 90 degrees? **Remembering**: (knowledge): What is the type of blood spatter that occurs when an instrument is flung in an arc such as a knife?  |
| **Instructional Strategies/Activities:*** Warm up activity: Kahoot Review. Students will respond to questions involving the science of blood spatter analysis.
* Instructor reviews the answers to Kahoot questions with students and checks for understanding.
* Lesson begins with a review of procedures for creating blood spatter at specified heights, angles, and velocity.
* A review of the unit vocabulary includes the terms: blood spatter, parent stain, elongated stain, satellite, spike, area of convergence.
* Instructor checks for understanding using the learning scale.
* Instructor assigns teams of four students the task of creating blood spatter using the following criteria:
	+ Free falling blood droplets from 90degrees at heights of 1 foot, 3 feet, and 6 feet.
	+ Medium velocity blood droplets by pushing the syringe with your thumb at angles of 60 degrees, 45 degrees, and 10 degrees.
	+ Free falling blood droplets while walking for ten feet.
	+ Free falling blood droplets while running for ten feet.
	+ High velocity blood droplets by hitting the syringe hard and fast at 20 degrees
* Students will use a long length of white sheet paper on the ground to create the blood spatter.
* Students will record the length and width of the parent droplet of each blood spatter activity.
* Team members will be assigned the roles of:
* Blood Dropper
* Recorder and Drawer
* Angle Measurer with Tape Measurer and Protractor
* Droplet Measurer (length and width of parent drop)
* Instructor will circulate to address inquiries of students and to check the methodologies being used and to check for understanding.
* Students will measure and record their blood spatter samples.
* Students will draw a picture of their blood sample including any tails, satellites, and spikes.
* Students will document the shape of the parent stain.
* Team members will analyze the size and shape of all blood spatter droplets and make any correlation to the heights, speed, and angle of impact.

 * Students are given an exit slip to write down the most important thing they learned during the activity. Students are also asked to rate their understanding of the lesson according to the learning scale.

  | **ELL/ESE Strategies** * **Handouts / Study Guides**
* **Multisensory Approach**
* **Peer / Adult Support**
* **Cooperative Learning Groups**
* **Think-Aloud**
* **Visual Aids**
* **Inquiry Approach**
* **Vocabulary Instruction**
* **Build Background Knowledge**
* **Advanced Learner Strategies**
* **Enrichment**
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| **Deliberate Practice****Element 1 : Using Engagement Strategies****My instructional techniques to promote student engagement include:****Using academic games.Using physical movement.Maintaining a lively pace.Demonstrating intensity and enthusiasm for the content.Using friendly controversy.Present unusual or intriguing information about the content.Providing opportunities for students to talk about themselves as it relates to the content.****Changes in student behavior/learning I expect to see as a result of focusing on this target strategy:****Student behaviors show awareness that the teacher is noticing students' level of engagement.****Behaviors show the engagement strategy increases engagement.****Student-centered tasks and processes produce high levels of engagement.****Talking with groups or in response to questions is focused on critical content.****Engaging in the critical content with enthusiasm.****Actions show students are motivated by the teacher.****Behaviors show students are inspired by the teachers.****Multiple students or the entire class respond to questions posed by the teacher.****Artifacts of student work indicate students are engaged in the critical content.****To increase student engagement, I will vary the engagement technique, reorganize groups, modify the task, utilize peer resources and vary resources.****Element 2 : Establishing and Maintaining Effective Relationships in a Student-Centered Classroom****Changes in student behavior/learning I expect to see as a result of focusing on this target strategy****My students contribute to a positive classroom community through interactions with their peers.****My students change their behavior when the teacher demonstrates an understanding of their interests and diverse backgrounds.****My students demonstrate verbal and nonverbal behaviors that indicate they feel accepted by their teacher.****My students respond positively to verbal interactions with their teacher.****My students readily share their perspectives and thinking with their teacher.****My students describe their teacher as respectful and responsive to the diverse needs of each student.****My students' actions show they trust their teacher to advocate for them.****My students seek additional input from students.****My students utilize peer resources.****State your Growth Goals for this element****My goal is to foster a sense of classroom community by acknowledging and demonstrating respect for the diversity of each student. The desired effect of the teaching strategies will show that my students feel valued and part of the classroom community.****Instructional techniques I will incorporate in my classroom include:****Complimenting my students for their academic and personal achievements.****Using humor and playful dialogue with my students.****Using positive nonverbal expressions such as a smile, nod, pat on the shoulder, thumbs up, elbow bump, applause, and eye contact.****Remaining calm in response to inflammatory situations.****Interacting with each student in the same calm and controlled manner.****Remaining objective and in control by not demonstrating personal offense at student misconduct.****Encouraging my students to share their thinking and perspectives.****Seek student input regarding classroom activities and culture.****Relate content-specific knowledge to personal aspects of students' lives.****Discuss with students topics in which they are interested.****Discuss the equity and individual needs of students.****Use student input and feedback to maintain an academic focus on rigor.****Build student interests into lessons making cultural connections.****Engage in conversations with students about events in their lives outside of school.****Celebrate students' individual diversity, uniqueness, and cultural traditions.** |
| Post Reflection* Instructor will write a reflection about her perceptions of the lesson and the intended and unintended outcomes.
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