



Who Did It?

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Grade Levels 6-8

July 16-19, 2018

CRIME SCENE DO NOT CROSS

Introduction

1. ***Rationale*** - *Why are the skills, content, and concepts presented in this unit important for students to learn?*

Skills:

This unit involves a wide range of skills needed to be successful as students move from the elementary setting to the middle and high school grades. These skills will be developed and refined as students move toward higher education. Students will need to persevere in order to shape their problem solving skills. Students will be able to do this through the development of skills that include: interpretation, investigation, analyzing, collaboration, generalization, justification, evaluating, hypothesizing, and critiquing of information. These skills are needed in every content area, but especially in the sciences. This unit contains science standards that range from 6th-12th grades. Standard topics include: Life Sciences, Biology, Forensics, and Crime Scenes & Criminal Law. As in all science courses, when solving problems, students follow a design concept or scientific method for solving. Each step in the process calls for perseverance before moving to the next step.

STEM Engineering Design Model	Scientific Method
1. Ask 2. Imagine 3. Plan 4. Create 5. Improve	1. Question 2. Hypothesize 3. Experiment 4. Observe & Record 5. Analyze 6. Share Results

Content:

Content in this unit refers to the factual information that students will need to learn in order to solve our problem of: “Who Did It?” In this unit, students will need to persevere to shape their problem solving skills to find out who committed the crime. In order for students to do this, they will need to be able to identify different types of evidence that includes: testimonial evidence, physical evidence, and trace evidence. Students will learn that procedures used in crime scene investigations are related to STEM engineering design models used in regular science classes. Students will learn the four steps of crime scene protocol: collection,

examination, analysis, and reporting. This is important because it reinforces relation between engineering design and the scientific method.

Students will learn that there are different types of evidence and all have different procedures for collection. Students will also have to evaluate information to determine what information is non-relevant to the problem versus relevant information to the problem. Examples of evidence that students may collect include: fingerprints, bite marks, broken fingernails, documents, body fluids, firearms & tool marks, shoeprints, tire tracks, fracture matches, hair, fibers, paint, glass, etc. Each type of evidence has specific procedures to follow in order to collect correctly. As each type of evidence needs to be collected in certain ways, the location of the evidence is just as relevant in the collection process.

Concept:

With this unit, the conceptual lens targeted is how perseverance shapes problem solving. Perseverance is a way to find a solution to problem-solving. According to Merriam-Webster, perseverance is a noun developed from the verb, persevere. Perseverance is “continued effort to do or achieve something despite difficulties, failure, or opposition: the action or condition or an instance of persevering: steadfastness.” When faced with a mystery, a person must evaluate the situation, collect facts or evidence of what has happened, and then come to a conclusion based on those facts. Therefore, perseverance shapes problem solving.

In forensic science, it is the investigator’s goal to find all facts that can be used to solve a case based on evidence. If the evidence does not support the hypothesis of what has happened in a crime scene, then the investigators have to pursue other avenues to obtain the truth behind the event. Forensic science uses observation, collection, and classification to narrow information and eliminate unnecessary information as well. When a crime scene investigator is called to a crime scene to evaluate the event, the first step is to not change the evidence. They must approach first through observation. They note what has happened, where items are found, and what eye witnesses have seen in response to the event. Once all observations are recorded, the investigator will then begin to collect the evidence at the scene. Each piece of evidence should be collected separately so not to cross contaminate possible trace evidence that is undetectable to the naked eye. Once all evidence is collected, then the investigator can return to the forensic lab to evaluate each item to develop a list of facts to support their theory of what happened in the event.

In the lab, the investigator can evaluate the evidence for DNA and other trace evidence. If a gun was involved in the crime, investigators can check the gun for markings that will match any bullets found. Investigators can check the weapon for residue of gunpowder to determine if the gun had been fired. If there was a victim found, they can evaluate the hands of that victim to see if they had trace evidence of using that gun on their hands. If a suspect is brought in for questioning, they can test that suspect for trace evidence of the gunpowder. They can test the victim themselves for trace

evidence of the criminal ranging from hair, blood, and other DNA based evidence. If they find DNA evidence on a victim other than their own DNA that can lead to match with a criminal.

Through perseverance for the facts, forensic scientists can support or change investigator's theories of what occurred during the problem they are solving. If the facts collected support the investigator's theory of who is guilty of a crime, then that person can be arrested and prosecuted for the crime. If the DNA does not support that theory, it can be used to prove the innocence to people so that they are not wrongly accused of a crime. Crime and how to solve it is a problem that must be solved. Investigation is the avenue to find the truth and answer to the problem. Facts are not prejudice. Facts are evaluated on their own merit. This helps to illuminate human error and illuminate mistakes that people can make when they let their heart lead what they believe. Forensic evidence and the support of the facts to find a solution to the problem allow investigators to solve crime without it becoming personal. It eliminates the possibility of accusing a person just because they think they are the one that is guilty. With facts to support their theory, they can bring true criminals to justice despite their personal feelings.

2. ***Differentiation for Gifted Learners*** – *What elements of this unit make it particular beneficial or appropriate for gifted learners? (Be sure to discuss the dimensions of differentiation: Content, Process, Product, and Learning Environment AND the features of differentiation: Complexity, Challenge, Depth, Creativity, and Acceleration)*

Dimensions of Differentiation:

Differentiation within content is that the content itself should be more challenging than the average curriculum. The curriculum should be above grade level. When discussing the process, you want to target high order thinking skills for how students will process the content and curriculum. The product students produce should be unique to each students and enable them to have choice in the product. Students should be allowed to use their personal strengths to produce products that show student readiness. The learning environment can offer differentiation to students through location, mobility, or even group size. The following table demonstrates differentiation examples from lessons in this unit.

Content	Process	Product	Learning Environment
Scientific relative vocabulary is embedded in articles and videos for lesson.	Students will engage in high level critical thinking through analyzing concepts.	Students will create a representation of the	Students will be placed in small groups for lesson activities.

Images are classroom appropriate for middle to HS students.	Use of technology incorporated into evidence collection. Student choice of resources or use of technology to create portfolio of information for presentation of performance task.	provided crime scene. Choices: photo collage, diagram, google draw, hand sketch diagram, edited printed diagram, PowerPoint, Science Poster Students will produce unique and/or original product for unit performance task based on student readiness.	Movement in classroom to view evidence from different angles and perception. Observation of crime scene as needed. (Students are mobile from room to crime scene.)
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Features of Differentiation:

There are several features of differentiation. These features include: complexity, challenge, depth, creativity, and acceleration. Complexity refers to the level of complicatedness of a topic. In other words, how difficult is the topic being presented. The topic should not be one level, but several layers of difficulty that must be addressed to reach success. The challenge can be the connectedness of the different levels of the topic. There should be a problem that needs addressing and the challenge is to find resolution for that problem. Depth is pulling those higher order thinking skills. Students are not just learning and returning information. Students are using skills such as designing, critiquing, integrating, and executing. As the instructor, we want students to dig deeper. Through this exploration, students must find a way to express their own creativity to the task of the unit. With any lesson, students must be able to demonstrate their readiness and learning through a choice of products. Allowing student's choice can develop and nurture creative thinking skills. Finally, acceleration is a way to describe the speed of which students learn. This does not refer to just teaching a higher grade curriculum to a group of students, but rather, moving to their starting point in the learning. If students pre-assess above entry level, start them where they are learning. If the students move through a lesson with proficiency faster than predicted, that is acceleration. All of these features underlie that students need to drive their learning at their pace and with their skills. This helps them to persevere through the challenges.

Goals and Outcomes

Content Goal and Outcomes

Goal 1: To develop understanding of key elements of crime scene investigation through connection to life sciences, inquiry, problem-solving, and documentation.

Students will be able to...

- A. Validate different types of evidence at a crime scene.
- B. Analyze testimonial, physical, and trace evidence.
- C. Compare and contrast procedures used at a crime scene to STEM engineering design models using skills of collection, examination, analysis, and reporting.
- D. Compare relevant versus non-relevant evidence in relation to location at a crime scene.

Process Goal and Outcomes

Goal 2: To develop perseverance skills in problem solving with application to science.

Students will be able to...

- A. Analyze different types of evidence for relevance to crime scene.
- B. Collaborate within small groups to observe, collect and report evidence.
- C. Generalize information in order to develop hypotheses to solution of problem to be solved (crime committed).
- D. Justify reasoning for conclusions to performance task based on evidence.
- E. Evaluate solutions of other students based on inferences from collected evidence.
- F. Critique crime scene observed and evidence collected in order to document collected evidence relevant to crime.
- G. Create a crime scene diagram.
- H. Interpret evidence collected from crime scene to drive deeper investigation or questioning.
- I. Define problem and suggest solution based on evidence collected.
- J. Persevere to ask a question when evidence collected does not give direct indication of guilty suspect of the crime.

Concept Goal and Outcomes

Goal 3: To understand the concept of perseverance.

- A. Transfer knowledge of crime scene evidence to interpretation of evidence at a crime scene.
- B. Predict solution of a crime based on unanswered questions that must be inferred through crime scene evidence collection.
- C. Create a portfolio of student choice in order to assemble evidence and produce recommendation of guilty suspect in relation to crime.

Assessment Plan

Lesson 1 – In lesson one, formative assessment was used to evaluate student performance. Teacher observation provided the opportunity to evaluate student collaboration and brainstorming. Students began to demonstrate perseverance with questions and make connection to concept through relation to skills needed in science class. At the end of the class, students were asked to summarize how perseverance shapes problem solving. Summaries were submitted by email.

Examples:

Student 1 – “perseverance shapes problem solving by giving you the strength or power to work with people you are not working with someone that is like you it helps you push and with perseverance you can work harder.”

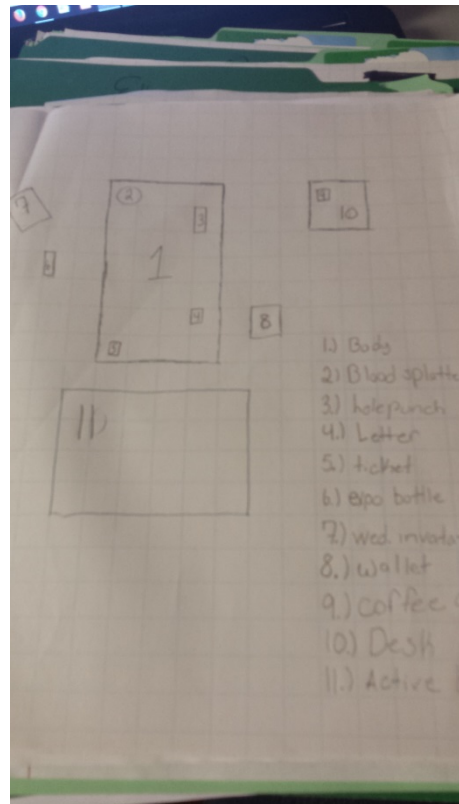
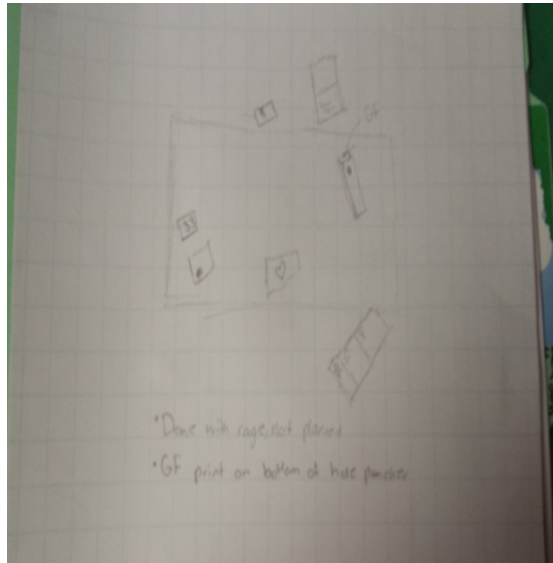
Student 2 – “Perseverance helps you solve a problem you need to have perseverance to not give up and to keep on going and you need that to solve a problem. The things I learned today gave me background knowledge about crime scene investigation. “

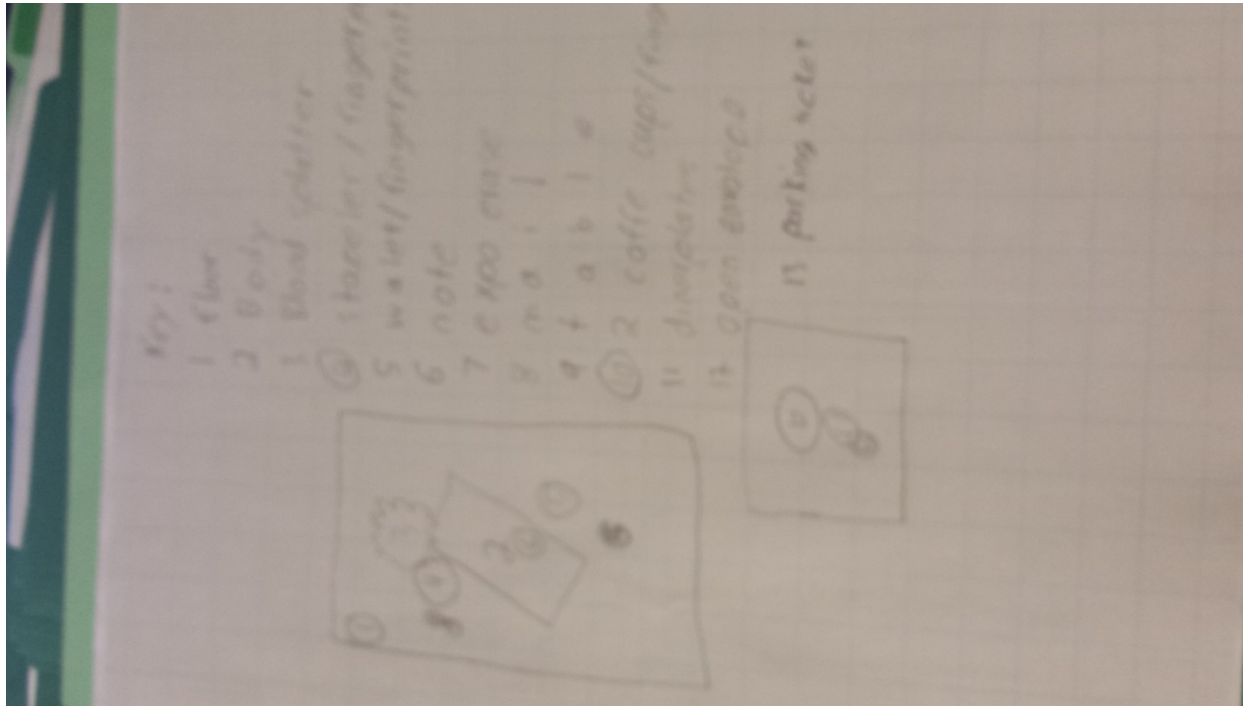
Student 3 – “If you give up and have no perseverance when you are problem solving then you wouldn't be able to problem solve because you would give up and wouldn't keep going.”

Student 4 – “If you have perseverance you will be a good problem solver because you won't give up even if it isn't looking like you will solve the problem. To figure out a problem most of the time you will need to persevere. Watson and Crick persevered to find and show DNA.”

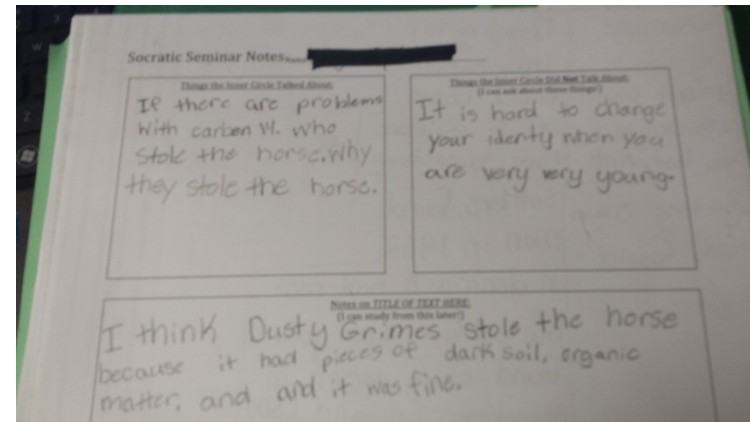
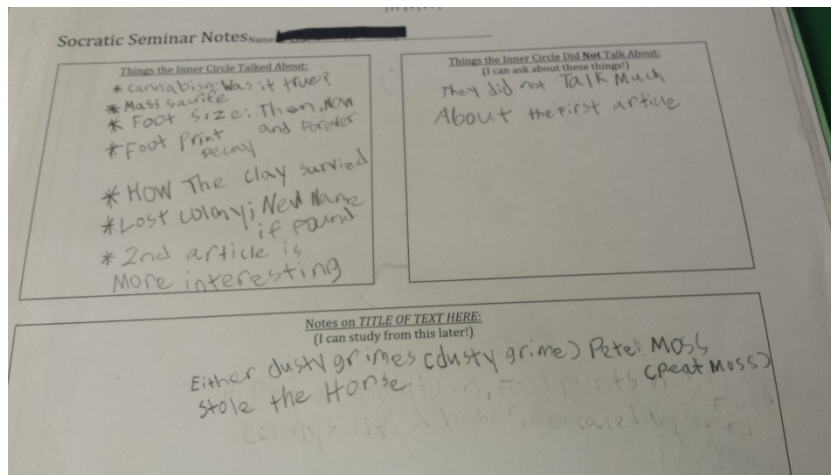
Lesson 2 – In lesson two, formative assessment allows the teacher to observe student collaboration and interactions when collecting evidence at the staged crime scene. This is important, because if the group does not collaborate with what they are observing and noting, some evidence may be overlooked due to time constraints at crime scene location. Each group was only allowed approximately 10 minutes to observe, on this day with time allotted later in the week if needed. This lesson was intended to have a post question, however time did not allow during instruction. This question is developed based on student needs and must be created based on student observation. The question is to be delivered in an exit ticket, or ticket out the door situation. If using a ticket out the

door for this assessment, you would be allowing students to pose what questions they have at the end of day two of lessons. The final assessment for this day is a collection of diagrams that were to be drawn at the crime scene. Below are images of three crime scene diagrams.





Lesson 3 – This lesson involved formative and summative assessments. The first formative assessment was in the form of assessing student use of a graphic organizer for the Socratic seminar. Student work samples of the graph organizer are included below. The use of an exit ticket was also incorporated for formative assessment of the lesson. Part of the lesson was to determine who stole a horse from Red Rock Ranch (reading passage). Included here is a screenshot of the exit ticket form that was to be used in Google forms. Students during this lesson did not have time to respond by form, so many answered questions on their graphic organizer from Socratic seminar.



QUESTIONS

RESPONSES

Exit Ticket 7/18/18

Form description

Email address *

Valid email address

This form is collecting email addresses. [Change settings](#)

Who does the class think stole the horse from Red Rock Ranch? *

Short answer text

Why? What evidence supports your conclusion? What background knowledge did you need to have to make your connections? *

Long answer text

Lesson 4 – In lesson four, formative assessment is used through convergent and divergent thinking in the CPS model. The class created a collaborate collection of facts to discuss the answer to “Who Did It?” for our crime scene lesson. Through teacher observation, it is able to observe perseverance develop to shape the student problem solving skills. Students continue to question and discuss different avenues to solutions to the crime. The final part of this unit is the summative assessment which is the completion of a performance task. Below is the performance task for this unit with examples of partially completed portfolios from students. Many students were not able to complete their portfolios for this unit, however, found success in discussions with other groups that their assumptions of who was guilty as the solution to our crime.

Performance Task: Who did it?

You are a crime scene investigator with the local sheriff’s department. Your challenge is to collect evidence relevant to a recent murder case in the county and submit your findings to the local district attorney (teacher). This information will be presented to a grand jury for indictment of the chosen criminal.

You will create a portfolio that must include personal data on each suspect, picture of each suspect, interview notes from each suspect, and a list of any evidence linked to the suspect found at the crime scene. Through your assembly of a crime scene portfolio, you will need to include a summary of your findings for each suspect and a recommendation to the district attorney on whether to seek arrest or not with each suspect. You will present your evidence from your portfolio to the grand jury (class), who will decide on indictment of the suspect.

Student 1—Screenshot of part of word document performance task.

Who did it?

submitted for

GUILTY

I think it was Scarlet Reid (the girlfriend) for these reasons

- She brings dinner then she leaves almost right after she brings the food because it was making her sick, which I don't think is true, she could have killed her boyfriend right before she left
- She had her lipstick from her mouth on the cup and it had her fingerprint on it
- There was a ripped love letter from Scarlet to Frank
 - David Smith got an invitation from Scarlet and Frank for them to get married

Student 2 & 3—These students created Google their performance task portfolio. Included here you the print page of the slide presentation.

Slide presentations for will find a screenshot of

Student 2—

Who Did It?

The Math Teacher Murder



Suspect #1: David Smith

- Occupation: English Teacher
- Important Facts:
 - Recently returned from Nottingham, England with one of the other suspects, Scarlet Reid
 - His wallet was found at crime scene
 - His fingerprints found on murder weapon
 - Parking ticket from England found at scene



The Victim

- Frank Jackson
- Age 28
- Math Teacher
- Murdered with hole puncher



Suspect #2: John Bruno

- Occupation: Security Guard
- Important Facts:
 - Found the body
 - Had criminal record
 - Let Smith in around 7:30
 - Didn't let Scarlet in
 - Escorted witness to her car



Suspect #3

- Relation to Victim: Girlfriend
- Important Facts:

dinner with victim at school

-Had

suspects, David Smith

-Went to Nottingham with one of the other

scene of the crime

-Lipstick on cup places her at the

note found at

-Love

Love You♡

Conclusion-The Murderer

Innocent: John Bruno

Guilt: David Smith, Scarlet Reid

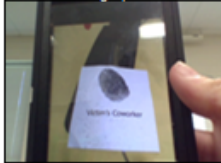
Why?: They were romantically involved and when he heard they were getting married, he snapped

Student 3—



Evidence to support Mr. Smith DID IT

His wallet was in the room with a parking ticket so he was definitely in the room. In the interview he said that he only saw Mrs. Cook and Mr. Bruno. Finally to top it all off his fingerprints were on the murder weapon (hole puncher).



Mr. Bruno

Bruno could have done it but he was escorting Mrs. Cook at the time of the murder. Finally he wanted to get away not go toward them.

The Girlfriend

It couldn't have been her. In the interview she said that she left "shortly after bringing Frank dinner", which would have been around 7:30 because she had to eat dinner altho she did stutter doing the last question I don't think it was her.

Hope You Like It.

Lesson Plans

TEACHER NAME		Lesson #
Manda Jackson		1
MODEL	CONTENT AREA	GRADE LEVEL
Taba Lesson	Science	7-8
CONCEPTUAL LENS		LESSON TOPIC
Perseverance		Forensic Science
LEARNING OBJECTIVES <i>(from State/Local Curriculum)</i>		
Grade 8 – 8.L.2 Understand how biotechnology is used to affect living organisms • 8.L.2.1 Summarize aspects of biotechnology 8.L.1 Understand the hazards caused by agents of diseases that affect living organisms. • 8.L.1.1 Summarize the basic characteristics of viruses, bacteria, fungi and parasites relating to the spread, treatment and prevention of disease.		

- 8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease.

8.L.4.1 Summarize the use of evidence drawn from geology, fossils, and comparative anatomy to form the basis for biological classification systems and the theory of evolution.

Grade 7—

7.L.1 Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life.

- **7.L.1.4 Summarize the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, and excretion) and ways that these systems interact with each other to sustain life.**

HS Biology—

Bio.3.3.1 Interpret how DNA is used for comparison and identification of organisms.

Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology

THE ESSENTIAL UNDERSTANDING <i>(What is the overarching idea students will understand as a result of this lesson?)</i>	THE ESSENTIAL QUESTION <i>(What question will be asked to lead students to “uncover” the Essential Understanding)</i>
Perseverance shapes Problem Solving	How does perseverance shape problem solving?
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	PROCESS SKILLS (What will students be able to do as a result of this lesson?)

• Types of Evidence include: testimonial, physical, and trace evidence • Police are not the only officials involved in the investigation of a crime. • Procedures used in crime investigation are related to STEM engineering design models we use in our science classes. • The four steps of crime scene protocol. ○ Collection ○ Examination ○ Analysis ○ Reporting • Different types of trace evidence that can be collected a scene of a crime. ○ Fingerprints ○ Bite Marks ○ Broken Fingernails ○ Questioned Documents ○ Blood and Body Fluids ○ Firearms & Tool marks ○ Shoeprints and Tire tracks ○ Fracture matches ○ Hair ○ Fibers ○ Paint ○ Glass	Students will be able to: • Students will be able to analyze. • Students will be able to collaborate. • Students will be able to form generalizations. • Students will be able to justify. • Students will be able to evaluate.
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GUIDING QUESTIONS <i>What questions will be asked to support instruction?</i> <i>Include both “lesson plan level” questions as well as questions designed to guide students to the essential understanding</i>			
Pre-Lesson Questions:		During Lesson Questions:	
		Post Lesson Questions:	

• What does it mean to persevere? • How do you know when a person is using perseverance? • What is DNA? • What is forensic science? • What is evidence? • How is DNA related to forensic science? • How is DNA related to evidence? • What is problem-solving? • How is problem-solving related to forensic science?	• Why are trace evidence samples collected differently? • What are examples of testimonial evidence? • What are examples of physical evidence? • What are examples of trace evidence? • What protocols must take place in crime scene investigation? • What professions are related to forensic science? • What type of classes would you have to take to have a career in forensic science? • Why is DNA considered part of forensic evidence? • What does CSI stand for?	• Why is forensic evidence good indicator of who committed crimes? • What questions does the articles raise for you in which we need more clarification? • What perseverance skills do we need to solve our case? • How does perseverance shape problem solving?
DIFFERENTIATION <i>(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.</i>		

Content	Process	Product	Learning Environment
Scientific relative vocabulary is embedded in articles and videos for lesson.	Students will engage in high level critical thinking through analyzing concepts.		Students will be grouped in small groups for grouping and re-grouping activities among themselves related to material from articles.
PLANNED LEARNING EXPERIENCES <i>(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)</i>			

Engage and Connect - *This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.*

Students will watch a two-part video from discovery education. The first video segment is about Watson & Crick and their advancements in DNA. In the second part of this video, students are introduced to how DNA evidence can be used to solve crimes. (3-5 mins)

I will introduce this through Pre-Lesson questioning. We will then watch the video segments separately. First DNA, then how it is used in crime scene investigation. We will discuss time spans mentioned in the video from beginning of the crime, until solved. We will also review diagram of crime scene shown in the video and start to look at information that is documented.

<https://nc.discoveryeducation.com/player/view/assetGuid/37a001e9-3014-499d-9407-b5209fbf240f>

Explore - *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

LISTING

Students will read two articles related to forensic science. The first article relates what is happening in courtrooms across the country due to the popularity of crime investigation television shows. The other article describes the procedures that must be followed when collecting different types of evidence. As students read, they will be expected to list on their own: important vocabulary, people, events, and procedures. They will also need to evaluate how those things they list are related to perseverance and problem-solving. (20 mins)

1. CSI Effect: https://usatoday30.usatoday.com/news/nation/2004-08-05-csi-effect_x.htm
2. Collection and Preservation of Evidence: <http://www.crime-scene-investigator.net/evidenc3.html>

Students and teacher will take part in class discussion of topics from articles. Teacher will make a combined list of student responses on chart paper for reference. List must contain at least 20 items. (20 mins)

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

GROUPING AND LABELING

- Students will be arranged four students per table group. Within the group, students will record all words/phrases from the board onto notecards. Then the group will decide on at least four categories in which the words/phrases could be grouped and labeled. The group will then make cards to label each grouping of words/phrases. Within the groups, students cannot use a word/phrase twice. Words/phrases must be grouped under one topic heading only. (Varied time depending on group progression.)
- Teacher will circulate as students create groupings. Teacher will have table discussion about why students are grouping some words/phrases together and not others.
- Once groupings are complete, teacher will make sure all groups have labeled each group of words/phrases.
- The teacher will ask each group to tell what labels they gave to their groupings and why they selected those words/phrases to fall under that label.
- Teacher will then direct class discussion of what similarities and differences groups had among topic labels. (Varied time)

Elaborate —*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways*

SUBSUMING, REGROUPING, RENAMING

- Students will be asked is there a topic that they could move or put under another of their original topic labels, if so, move that topic. (2 mins)
- Students will then be asked to regroup their topics. Topics can be reused, but topic labels must be different. Students must develop at least 4 new ways to label their topics. This time students need to make sure that their topics are related to our concept of ***Perseverance***. (8-10 minutes)
- Teacher will discuss with groups their regrouping labels and what made them group them in this different way. (5 mins)

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

GENERALIZING

- Teacher will close lesson by asking students to make connections between perseverance and problem-solving. Students will be expected to summarize from this experience how investigations lead us to the resolution of mysteries. Students will submit their summaries through google docs.
- Informal evaluation will take part in this lesson as the teacher observes teacher collaboration and brainstorming for groupings of topics.
- Teacher should be able to observe perseverance in students and problem-solving strategies immerge as students discuss and regroup words/phrases into different topics throughout the lesson.

Unit Resources:

<http://www.sciencemystery.com/>

<http://sciencespot.net/Pages/classforsci.html#CSIadventure>

<https://www.forensicscolleges.com/usa/north-carolina>

<https://www.wsfcs.k12.nc.us/site/Default.aspx?PageID=77752>

<https://www.abss.k12.nc.us/Page/11720>

<https://oucc.dasa.ncsu.edu/forensic-science-17fscm/>

<http://www.ncdoj.gov/crime-lab.aspx>

<http://stem-works.com/subjects/3-forensics>

<http://stem-works.com/subjects/3-forensics/articles/5> History of Fingerprints article

http://anthropology.si.edu/writteninbone/facial_reconstruction.html Article on Facial Recognition

Take a tour of a forensic biology lab <http://stem-works.com/external/activity/6>

Collection and Preservation of Evidence <http://www.crime-scene-investigator.net/evidenc3.html>

CSI: Crime Scene Adventures: <http://forensics.rice.edu/>

The Four Step Forensic Process: https://www.researchgate.net/figure/The-Four-Step-Forensic-Process-FSFP-after-Kent-et-al-2006_fig3_258224615

Article CSI Effect: https://usatoday30.usatoday.com/news/nation/2004-08-05-csi-effect_x.htm

Crime Scene Simulation: http://documents.routledge-interactive.s3.amazonaws.com/9781455731381/student/content/Crime_Scene_Simulation/activity.html

CSI: New Orleans (CBS): <https://www.cbs.com/shows/ncis-new-orleans/>

Discovery Ed Links

<https://nc.discoveryeducation.com/player/view/assetGuid/561b1cb7-dd13-4998-bcc9-71628c10f732>

<https://nc.discoveryeducation.com/player/view/assetGuid/f8df99bc-fc84-401e-ade6-466e52500f26>

YouTube Videos

*14 Amazing Forensic Science Techniques: <https://www.youtube.com/watch?v=g7KCFpALTrI>

Forensic Science Timeline: <https://www.youtube.com/watch?v=epRcZL1KI2Y>

What is Forensic Science: https://www.youtube.com/watch?v=_58XsN6XJWQ

*The Real Science of Forensics: <https://www.youtube.com/watch?v=h3-Pj-zbEq8>

SciShow YouTube Channel Page: https://www.youtube.com/user/scishow?disable_polymer=true

Lesson 1 Printable Resources

Lesson 1 Article 1: 'CSI Effect' Has Juries Wanting More Evidence

https://usatoday30.usatoday.com/news/nation/2004-08-05-csi-effect_x.htm

USA TODAY

Nation

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Posted 8/5/2004 1:05 AM Updated 8/5/2004 1:06 AM

'CSI effect' has juries wanting more evidence
By Richard Willing, USA TODAY

Like viewers across the nation, folks in Galveston, Texas, watch a lot of TV shows about crime-scene investigators. Jury consultant Robert Hirschhorn couldn't be happier about that.



CSI: Miami characters sort through evidence. It seems the crime show franchise has given jurors an incomplete picture of forensics.

CBS

Hirschhorn was hired last year to help defense attorneys pick jurors for the trial of Robert Durst, a millionaire real estate heir who was accused of murdering and dismembering a neighbor, Morris Black. It was a case in which investigators never found Black's head. The defense claimed that wounds to the head might have supported Durst's story that he had killed Black in self-defense.

Hirschhorn wanted jurors who were familiar with shows such as *CSI: Crime Scene Investigation* to spot the importance of such a gap in the evidence. That wasn't difficult: In a survey of the 500 people in the jury pool, the defense found that about 70% were viewers of CBS' *CSI* or similar shows such as Court TV's *Forensic Files* or NBC's *Law & Order*.

Durst was acquitted in November. To legal analysts, his case seemed an example of how shows such as *CSI* are affecting action in courthouses across the USA by, among other things, raising jurors' expectations of what prosecutors should produce at trial.

Prosecutors, defense lawyers and judges call it "the *CSI* effect," after the crime-scene shows that are among the hottest attractions on television. The shows —*CSI* and *CSI: Miami*, in particular — feature high-tech labs and glib and gorgeous techies. By shining a glamorous light on a gory profession, the programs also have helped to draw more students into forensic studies.

But the programs also foster what analysts say is the mistaken notion that criminal science is fast and infallible and always gets its man. That's affecting the way lawyers prepare their cases, as well as the expectations that police and the public place on real crime labs. Real crime-scene investigators say that because of the programs, people often have unrealistic ideas of what criminal science can deliver.

Like Hirschhorn, many lawyers, judges and legal consultants say they appreciate how *CSI*-type shows have increased interest in forensic evidence.

"Talking about science in the courtroom used to be like talking about geometry — a real jury turnoff," says Hirschhorn, of Lewisville, Texas. "Now that there's this almost obsession with the (TV) shows, you can talk to jurors about (scientific evidence) and just see from the looks on their faces that they find it fascinating."

But some defense lawyers say *CSI* and similar shows make jurors rely too heavily on scientific findings and unwilling to accept that those findings can be compromised by human or technical errors.

Prosecutors also have complaints: They say the shows can make it more difficult for them to win convictions in the large majority of cases in which scientific evidence is irrelevant or absent.

"The lesson that both sides can agree on is, what's on TV does seep into the minds of jurors," says Paul Walsh, chief prosecutor in New Bedford, Mass., and president of the National District Attorneys Association. "Jurors are going to have information, or what they think is information, in mind. That's the new state of affairs."

Lawyers and judges say the *CSI* effect has become a phenomenon in courthouses across the nation:

- In Phoenix last month, jurors in a murder trial noticed that a bloody coat introduced as evidence had not been tested for DNA. They alerted the judge. The tests hadn't been needed because the defendant had acknowledged being at the murder scene. The judge decided that TV had taught jurors about DNA tests, but not enough about when to use them.
- Three years ago in Richmond, Va., jurors in a murder trial asked the judge whether a cigarette butt found during the investigation could be tested for links to the defendant. Defense attorneys had ordered DNA tests but had not yet introduced them into evidence. The jury's hunch was correct — the tests exonerated the defendant, and the jury acquitted him.
- In Arizona, Illinois and California, prosecutors now use "negative evidence witnesses" to try to assure jurors that it is not unusual for real crime-scene investigators to fail to find DNA, fingerprints and other evidence at crime scenes.
- In Massachusetts, prosecutors have begun to ask judges for permission to question prospective jurors about their TV-watching habits. Several states already allow that.

- Last year in Wilmington, Del., federal researchers studying how juries evaluate scientific evidence staged dozens of simulated trials. At one point, a juror struggling with especially complicated DNA evidence lamented that such problems never come up "on *CSI*."

The *CSI* effect also is being felt beyond the courtroom.

At West Virginia University, forensic science is the most popular undergraduate major for the second year in a row, attracting 13% of incoming freshmen this fall. In June, supporters of an Ohio library drew an overflow crowd of 200-plus to a luncheon speech on DNA by titling it "CSI: Dayton."

The Los Angeles County Sheriff's Department crime lab has seen another version of the *CSI* effect. Four technicians have left the lab for lucrative jobs as technical advisers to crime-scene programs. "They found a way to make science pay," lab director Barry Fisher says.

Shows' popularity soars

CSI, which begins its fifth season next month, was America's second-most-popular TV program during the season that began last fall, after the Tuesday edition of *American Idol*.

CSI and a spinoff, *CSI: Miami* (which is about to begin its third season), have drawn an average of more than 40 million viewers a week during the past TV season. *Law & Order*, whose plots sometimes focus on forensic evidence, has been the 13th-most-watched show during the 2003-04 season, averaging about 15 million viewers. On cable, the Discovery Channel, A&E and Court TV have programs that highlight DNA testing or the analysis of fingerprints, hair and blood-spatter patterns.

CSI: NY, set in New York City, is slated to premiere next month.

The *CSI* shows combine whiz-bang science with in-your-face interrogations to solve complex crimes. Some sample dialogue from actor David Caruso, the humorless monotone who plays investigator Horatio Caine on *CSI: Miami*: "He (the bad guy) doesn't know how evidence works, but you know what? He will."

The shows' popularity, TV historians say, is partly a result of their constant presence. Counting network and cable, at least one hour of crime-forensics programming airs in prime time six nights a week.

The stars of the shows often are the equipment — DNA sequencers, mass spectrometers, photometric fingerprint illuminators, scanning electron microscopes. But the technicians run a close second.

"It's 'geek chic,' the idea that kids who excel in science and math can grow up to be cool," says Robert Thompson, who teaches the history of TV programming at Syracuse University. "This is long overdue. ... Cops and cowboys and doctors and lawyers have been done to death."

Departing from reality

Some of the science on *CSI* is state-of-the-art. Real lab technicians can, for example, lift DNA profiles from cigarette butts, candy wrappers and gobs of spit, just as their Hollywood counterparts do.

But some of what's on TV is far-fetched. Real technicians don't pour caulk into knife wounds to make a cast of the weapon. That wouldn't work in soft tissue. Machines that can identify cologne from scents on clothing are still in the experimental phase. A criminal charge based on "neuro-linguistic programming" — detecting lies by the way a person's eyes shift — likely would be dismissed by a judge.

But real scientists say *CSI*'s main fault is this: The science is always above reproach.

"You never see a case where the sample is degraded or the lab work is faulty or the test results don't solve the crime," says Dan Krane, president and DNA specialist at Forensic Bioinformatics in Fairborn, Ohio. "These things happen all the time in the real world."

Defense lawyers say the misconception that crime-scene evidence and testing are always accurate helps prosecutors. "Jurors expect the criminal justice system to work better than it does," says Betty Layne DesPortes, a criminal defense lawyer in Richmond, Va., who has a master's degree in forensic science.

She notes that during the past 15 years, human errors and corruption have skewed test results in crime labs in West Virginia, Pennsylvania, California, Texas and Washington state.

But prosecutors say the shows help defense lawyers. Jurors who are regular viewers, they say, expect testable evidence to be present at all crime scenes.

In fact, they say, evidence such as DNA and fingerprints — the staple of *CSI* plots — is available in only a small minority of cases and can yield inconclusive results.

"Defense attorneys will get up there and bang the rail and say 'Where were the DNA tests?' to take advantage of the idea that's in the juror's mind," says Joshua Marquis, a prosecutor in Astoria, Ore. "You've got to do a lot of jury preparation to defeat that."

Some prosecutors have gone to great lengths to lower jurors' expectations about such evidence.

In Belleville, Ill., last spring, prosecutor Gary Duncan called on seven nationally recognized experts to testify about scientific evidence against a man accused of raping and murdering a 10-year-old girl. The witnesses included specialists in human and animal DNA, shoe-print evidence, population statistics and human mitochondrial DNA, genetic material that is inherited only from one's mother and that seldom is used in criminal cases. Duncan won a conviction.

"I wanted to be certain the jury was clear on the evidence and its meaning," he says. "These days, juries demand that."

CSI producers acknowledge that they take some liberties with facts and the capabilities of science, but they say it's necessary to keep their story lines moving.

Elizabeth Devine, a former crime lab technician who writes and produces episodes of *CSI: Miami*, spoke at a training seminar for prosecutors last year in Columbia, S.C. She said that if the shows did not cut the time needed to perform DNA tests from weeks to minutes, a villain might not be caught before "episode five."

For all of *CSI*'s faults, some lab technicians say they have a soft spot for the TV version of their world. "It's great for getting people interested (in) careers" in forensic science, says Barbara Llewellyn, director of DNA analysis for the Illinois State Police.

Terry Melton, president of Mitotyping Technologies in State College, Pa., says the programs have made "jury duty something people now look forward to."

And Fisher says the shows have given "science types" like himself some unexpected cachet.

"When I tell someone what I do, I never have to explain it now," he says. "They know what a crime-scene (technician) does. At least, they think they do."

Lesson 1 Article 2: Collection and Preservation of Evidence

<http://www.crime-scene-investigator.net/evidenc3.html>

Collection and Preservation of Evidence

by George Schiro
Forensic Scientist
Louisiana State Police Crime Laboratory

Once the crime scene has been thoroughly documented and the locations of the evidence noted, then the collection process can begin. The collection process will usually start with the collection of the most fragile or most easily lost evidence. Special consideration can also be given to any evidence or objects which need to be moved. Collection can then continue along the crime scene trail or in some other logical manner. Photographs should also continue to be taken if the investigator is revealing layers of evidence which were not previously documented because they were hidden from sight.

Most items of evidence will be collected in paper containers such as packets, envelopes, and bags. Liquid items can be transported in non-breakable, leakproof containers. Arson evidence is usually collected in air-tight, clean metal cans. Only large quantities of dry powder should be collected and stored in plastic bags. Moist or wet evidence (blood, plants, etc.) from a crime scene can be collected in plastic containers at the scene and transported back to an evidence receiving area if the storage time in plastic is two hours or less and this is done to prevent contamination of other evidence. Once in a secure location, wet evidence, whether packaged in plastic or

paper, must be removed and allowed to completely air dry. That evidence can then be repackaged in a new, dry paper container.

UNDER NO CIRCUMSTANCES SHOULD EVIDENCE CONTAINING MOISTURE BE PACKAGED IN PLASTIC OR PAPER CONTAINERS FOR MORE THAN TWO HOURS. Moisture allows the growth of microorganisms which can destroy or alter evidence.

Any items which may cross contaminate each other must be packaged separately. The containers should be closed and secured to prevent the mixture of evidence during transportation. Each container should have: the collecting person's initials; the date and time it was collected; a complete description of the evidence and where it was found; and the investigating agency's name and their file number.

Each type of evidence has a specific value in an investigation. The value of evidence should be kept in mind by the investigator when doing a crime scene investigation. For example, when investigating a crime he or she should spend more time on collecting good fingerprints than trying to find fibers left by a suspect's clothing. The reason is that fingerprints can positively identify a person as having been at the scene of a crime, whereas fibers could have come from anyone wearing clothes made out of the same material. Of course if obvious or numerous fibers are found at the point of entry, on a victim's body, etc., then they should be collected in case no fingerprints of value are found. It is also wise to collect more evidence at a crime scene than not to collect enough evidence. An investigator usually only has one shot at a crime scene, so the most should be made of it.

The following is a breakdown of the types of evidence encountered and how the evidence should be handled:

Fingerprints

Fingerprints (also includes palm prints and bare footprints) are the best evidence to place an individual at the scene of a crime.

Collecting fingerprints at a crime scene requires very few materials, making it ideal from a cost standpoint. All non-movable items at a

crime scene should be processed at the scene using gray powder, black powder, or black magnetic powder. Polaroid 665 black and white film loaded in a Polaroid CU-5 camera with detachable flash should be used to make one-to-one photographs of prints which do not readily lift. All small transportable items should be packaged in paper bags or envelopes and sent to the crime lab for processing. Because of the "package it up and send it to the lab" mentality, some investigators skim over collecting prints at a crime scene. Collecting prints at the crime scene should be every investigator's top priority. Fingerprints from the suspect as well as elimination fingerprints from the victim will also be needed for comparison (the same holds true for palm and bare footprints).

Bite Marks

Bite marks are found many times in sexual assaults and can be matched back to the individual who did the biting. They should be photographed using an ABFO No. 2 Scale with normal lighting conditions, side lighting, UV light, and alternate light sources. Color slide and print film as well as black and white film should be used. The more photographs under a variety of conditions, the better. Older bitemarks which are no longer visible on the skin may sometimes be visualized and photographed using UV light and alternate light sources. If the bitemark has left an impression then maybe a cast can be made of it. Casts and photographs of the suspect's teeth and maybe the victim's teeth will be needed for comparison. For more information consult a forensic odontologist.

Broken Fingernails

Much like a bullet that has individualizing striations on it, natural fingernails have individualizing striations on them. A broken fingernail found at a crime scene can be matched to the individual it came from many months after the crime has been committed. Broken fingernails should be placed in a paper packet which is then placed in a paper envelope. It can then be transported to the crime lab for analysis. Known samples from the suspect and maybe from the victim will be needed for comparison.

Questioned Documents

Handwriting samples can also be matched back to the individual that produced them. Known exemplars of the suspected person's handwriting must be submitted for comparison to the unknown samples. Questioned documents can also be processed for fingerprints. All items should be collected in paper containers. For more information consult a questioned documents examiner.

Blood and Body Fluids

If using the RFLP method of DNA analysis, then blood and seminal fluid can be matched back to an individual with a high degree of probability. Currently, if using the PCR method of DNA analysis or conventional serological techniques then blood and some body fluids can be said to come from a certain population group to which the individual belongs. As PCR technology advances, these population groups will become smaller, eventually giving it the same discriminating power as RFLP analysis has today. Dried blood and body fluid stains should be collected in the following manner: If the stained object can be transported back to the crime lab, then package it in a paper bag or envelope and send it to the lab; if the object cannot be transported, then either use fingerprint tape and lift it like a fingerprint and place the tape on a lift back; scrape the stain into a paper packet and package it in a paper envelope; or absorb the stain onto 1/2" long threads moistened with distilled water. The threads must be air dried before permanently packaging. For transportation purposes and to prevent cross contamination, the threads may be placed into a plastic container for no more than two hours. Once in a secure location, the threads must be removed from the plastic and allowed to air dry. They may then be repackaged into a paper packet and placed in a paper envelope. Wet blood and body fluid stains should be collected in the following manner: all items should be packaged separately to prevent cross contamination, if the item can be transported to the crime lab, then package it in a paper bag (or plastic bag if the transportation time is under two hours), bring it to a secure place and allow it to thoroughly air dry, then repackage it in a paper bag. If the item cannot be transported back to the lab, then absorb the stain onto a small (1"x1") square of pre-cleaned 100% cotton sheeting. Package it in paper (or plastic if the transportation time is less than two hours), bring it to a secure place and allow it to thoroughly air dry; then repackage it in a paper envelope. UNDER NO CIRCUMSTANCES SHOULD WET OR

MOIST ITEMS REMAIN IN PLASTIC OR PAPER CONTAINERS FOR MORE THAN TWO HOURS. Victim and suspect's known whole blood samples will have to be collected in yellow, red, or purple top "Vacutainers." Contact the lab to which the samples will be submitted for specific information.

Firearms and Tool Marks

Bullets and casings found at the crime scene can be positively matched back to a gun in the possession of a suspect. Bullets and casings can also be examined at the crime lab and sometimes tell an investigator what make and model of weapons may have expended the casing or bullet. A bullet found at the crime scene can sometimes be matched back to the same lot of ammunition found in a suspect's possession. Toolmarks can be positively matched to a tool in the suspect's possession. Firearm safety is a must at any crime scene. If a firearm must be moved at a crime scene, never move it by placing a pencil in the barrel or inside the trigger guard. Not only is this unsafe, but it could damage potential evidence. The gun can be picked up by the textured surface on the grips without fear of placing unnecessary fingerprints on the weapon. Before picking up the gun, make sure that the gun barrel is not pointed at anyone. Keep notes on the condition of the weapon as found and steps taken to render it as safe as possible without damaging potential evidence. The firearm can then be processed for prints and finally rendered completely safe. **FIREARMS MUST BE RENDERED SAFE BEFORE SUBMISSION TO THE CRIME LAB.** The firearm should be packaged in an envelope or paper bag separately from the ammunition and/or magazine. The ammunition and/or magazine should be placed in a paper envelope or bag. It is important that the ammunition found in the gun be submitted to the crime lab. Any boxes of similar ammunition found in a suspect's possession should also be placed in a paper container and sent to the crime lab. Casings and/or bullets found at the crime scene should be packaged separately and placed in paper envelopes or small cardboard pillboxes. If knives (or other sharp objects) are being submitted to the lab (for toolmarks, fingerprints, serology, etc.), then the blade and point should be wrapped in stiff unmovable cardboard and placed in a paper bag or envelope. The container should be labeled to warn that the contents are sharp and precautions should be taken. This is to prevent anyone from being injured.

Shoeprints and Tire Tracks

Shoeprints and tire tracks can be matched positively to a pair of shoes or to tires in a suspect's possession. Shoeprints and tire tracks can sometimes tell investigators what type of shoes or tires to look for when searching a suspect's residence or vehicles. Before any attempt is made at collecting shoeprints or tire tracks, one-to-one photographs should be made using a tripod, ruler, and level. The flash should be held at about 45 degree angles from the surface containing an impression. Casts can be made of impressions using dental stone. Once hardened, the cast can be packaged in paper and submitted to the lab. When photographing prints on hard flat surfaces the flash should be used as side lighting. Shoeprints on hard flat surfaces can also sometimes be lifted like a fingerprint. Dust prints on certain surfaces can be lifted with an electrostatic dustprint lifter.

Fracture Matches

Fracture matches can positively link broken pieces at the scene with pieces found in the possession of a suspect. For example, headlight fragments found at the scene of a hit and run could be positively matched to a broken headlight (just like putting together a jigsaw puzzle) on a suspect's vehicle. Larger fragments should be placed in paper bags or envelopes. Smaller fragments should be placed in a paper packet and then placed in an envelope.

Hair

If a root sheath is attached, then DNA analysis using PCR technology can say that this hair came from a certain percentage of the population to which the suspect belongs. If there is no root sheath, then a microscopic analysis can say that the hair has the same

characteristics as the suspect's hair and is similar to his or her hair. At this point, no one can say that a hair came from a particular individual. Hair found at the scene should be placed in a paper packet and then placed in an envelope. If a microscopic examination is required, then 15-20 representative hairs from the suspect must be submitted to the lab for comparison. If DNA analysis is going to be used, then a whole blood sample from the suspect must be submitted to the lab in a "Vacutainer." Contact a DNA lab for more information.

Fibers

Fibers can be said that they are the same type and color as those found in a suspect's clothes, residence, vehicle, etc. Fibers should be collected in a paper packet and placed in an envelope. Representative fibers should be collected from a suspect and submitted to the lab for comparison.

Paint

Paint can be said that it is the same type and color as paint found in the possession of a suspect. Paint fragments should be collected in a paper packet and placed in an envelope. Representative paint chips or samples should be collected from the suspect and submitted to the lab for comparison.

Glass

Glass can be said that it has the same characteristics as glass found in the possession of a suspect. Smaller glass fragments should be placed in a paper packet and then in an envelope. Larger pieces should be wrapped securely in paper or cardboard and then placed

in a padded cardboard box to prevent further breakage. Representative samples from the suspect should be submitted to the lab for comparison.

Other Trace Evidence

Sometimes during the commission of a crime, there are other items which may be transferred to a perpetrator from the scene or from the perpetrator to the scene (sheetrock, safe insulation. etc.). The guidelines for collecting the evidence and obtaining known samples is about the same as for paint and fibers. For specific information, contact your crime lab.

TEACHER NAME		Lesson #
Manda Jackson		2
MODEL	CONTENT AREA	GRADE LEVEL
VTS (Visual Thinking Strategies) and Bruner's	Science	7-8
CONCEPTUAL LENS		LESSON TOPIC
Perseverance		Forensic Science
LEARNING OBJECTIVES <i>(from State/Local Curriculum)</i>		
Grade 8 – 8.L.2 Understand how biotechnology is used to affect living organisms 8.L.2.1 Summarize aspects of biotechnology 8.L.1 Understand the hazards caused by agents of diseases that affect living organisms. 8.L.1.1 Summarize the basic characteristics of viruses, bacteria, fungi and parasites relating to the spread, treatment and prevention of disease. 8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease. 8.L.4.1 Summarize the use of evidence drawn from geology, fossils, and comparative anatomy to form the basis for biological classification systems and the theory of evolution. Grade 7— 7.L.1 Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life. 7.L.1.4 Summarize the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, and excretion) and ways that these systems interact with each other to		

sustain life.

HS Biology—

Bio.3.3.1 Interpret how DNA is used for comparison and identification of organisms.

Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology

Forensics--

For 1.1 Understand that inquiry is the integration of process skills the application of scientific content and critical thinking to solve problems

Crime Scenes & Criminal Law—

For 2.1.1 Describe the procedures used to secure a crime scene

For 2.1.2 Apply the use of search grids for evidence collection For 2.1.3 Diagram and photograph crime scenes

THE ESSENTIAL UNDERSTANDING <i>(What is the overarching idea students will understand as a result of this lesson?)</i>	THE ESSENTIAL QUESTION <i>(What question will be asked to lead students to “uncover” the Essential Understanding)</i>
Perseverance shapes Problem Solving	How does perseverance shape problem solving?
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	PROCESS SKILLS (What will students be able to do as a result of this lesson?)

Students will know THAT..... • There are different types of evidence at a crime scene: ○ Fingerprints ○ Bite Marks ○ Broken Fingernails ○ Questioned Documents ○ Blood and Body Fluids ○ Firearms & Tool marks ○ Shoeprints and Tire tracks ○ Fracture matches ○ Hair ○ Fibers ○ Paint ○ Glass • Some non-relevant information will also be found a crime scene • Evidence collection must follow specific procedures ○ <u>http://www.crime-scene-investigator.net/evidenc3.html</u> • Location of evidence within a crime scene can relate important information to investigation	Students will be able to.... • Work collaboratively • Hypothesize • Analyze • Critique • Create a crime scene diagram • Interpret
GUIDING QUESTIONS <i>What questions will be asked to support instruction?</i> <i>Include both “lesson plan level” questions as well as questions designed to guide students to the essential understanding</i>	
Pre-Lesson Questions:	During Lesson Questions:
	Post Lesson Questions:

• How can we document evidence for future review in problem-solving our investigation? • What skills do we need to document crime scene evidence? • What is a crime scene diagram? • Why is a crime scene diagram important? • What have we learned about perseverance? • How does a crime scene involve problem-solving? • How does evaluation of evidence demonstrate perseverance?	• How are you going to persevere to document evidence at our crime scene? • Who is responsible for collection of different evidence? • What evidence do we observe? • How can we mark our evidence for collection? • How can we document our evidence we collect? • Does documentation or organization of our evidence pose any problems? • What strategies can we implement to document evidence collection? • How can we document location of the evidence within the crime scene?	• Why is forensic evidence a good indicator of who committed crimes? • Why is location of evidence important in crime scene investigation? • Why is it important to document all evidence? • How does perseverance shape problem solving?	
DIFFERENTIATION <i>(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.</i>			
Content	Process	Product	Learning Environment

Scientific relative vocabulary is embedded in articles, videos, and class discussion. Images are classroom appropriate for middle to HS students.	Use of technology incorporated into evidence collection.	Students will create a representation of the provided crime scene. Choices: photo collage, diagram, google draw, hand sketch diagram, edited printed diagram, PowerPoint, Science Poster	Movement in classroom to view evidence from different angles and perception. Students will be grouped in small groups for crime scene documentation.
PLANNED LEARNING EXPERIENCES <i>(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)</i>			
Engage and Connect -- <i>This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students. (15 mins)</i> - Students will be presented with a diagram of a crime scene along with a photograph of the same crime scene. The diagram and photo will be copies available at each table. I will use the document camera to display each to the class on the activeboard. - The class will discuss the information students suggest they can see from the examples. - The Teacher will continue to ask students what they see represented as well as what this may make them question. (Questions may include: What's going on in the picture? What do you see that makes you think that? What else can you find?) - Students will respond and teacher will repeat again with students responding. - Teacher will review process of evidence collection and review tools to be used in our crime scene investigation. (Blank Diagram, photos, phone use, tools for measurement use, tools for collection, and location of other needed supplies that they will have access to.) Explore - <i>In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a</i>			

facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas. (30 mins)

- Teacher will lead students to the crime scene area.
- Students will work in pairs to collect crime scene evidence starting with observation of the crime scene.
- Before students are allowed to collect any evidence, teacher will lead students in visual identification of evidence and discussion of how we could collect that information. What tools would we use to collect evidence? What safety procedures do we need to follow? How can we identify and label evidence prior to collection? How can we visual represent the location and document evidence in reference to other materials at the crime scene?
- Students will work in pairs to identify evidence, document location of evidence, and finally collect information for deeper review.

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding. (45 mins)*

- Students will document their evidence collection.
- Students can use the following choices to document the evidence collection process. (**Choices: photo collage, diagram, google draw, hand sketch diagram, edited printed diagram, PowerPoint, Poster**)

(15 mins)

- Teacher will ask students to review crime as it is defined.
- Teacher will ask each group which evidence they collected that they feel is important to solving the mystery.
- Students will share how they documented the crime scene and what evidence that they observed that they feel is important to the solving of the crime.
- Students will list evidence in table (what is important vs. irrelevant evidence)

Elaborate —*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways.*

(10-15 mins)

- Students will identify trace, DNA, physical, and other evidence present at crime scene.
- Students within their investigation pairs will evaluate evidence they observed, and determine what test could be run on the evidence to provide more detailed information.

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

- Teacher will close lesson by asking students to answer Post Lesson Questions for today's lesson. Students will discuss their understandings of these questions through class discussion.
- Informal evaluation will take part in this lesson as the teacher observes student collaboration and student collection of evidence.
- Evaluation of evidence collection through stage "Explain" in this lesson. Rubric will be provided.

https://drive.google.com/file/d/1hnAYTJmli99kaXzxeKfbhXT_RZhNCsOg/view?usp=sharing

Other Resources from Lesson 1:

These resources will be used throughout the week to enhance all lessons.

Current crime scene is under development. I still have to build items for the setup of the crime scene and determine if the scene will be in my classroom or somewhere else in the building.

Unit Resources:

<http://www.sciencemystery.com/>

<http://sciencespot.net/Pages/classforsci.html#CSIadventure>

<https://www.forensicscolleges.com/usa/north-carolina>

<https://www.wsfcs.k12.nc.us/site/Default.aspx?PageID=77752>

<https://www.abss.k12.nc.us/Page/11720>

<https://oucc.dasa.ncsu.edu/forensic-science-17fscm/>

<http://www.ncdoj.gov/crime-lab.aspx>

<http://stem-works.com/subjects/3-forensics>

<http://stem-works.com/subjects/3-forensics/articles/5> History of Fingerprints article

http://anthropology.si.edu/writteninbone/facial_reconstruction.html Article on Facial Recognition

Take a tour of a forensic biology lab <http://stem-works.com/external/activity/6>

Collection and Preservation of Evidence <http://www.crime-scene-investigator.net/evidenc3.html>

CSI: Crime Scene Adventures: <http://forensics.rice.edu/>

Article CSI Effect: https://usatoday30.usatoday.com/news/nation/2004-08-05-csi-effect_x.htm

Discovery Ed Links

<https://nc.discoveryeducation.com/player/view/assetGuid/37a001e9-3014-499d-9407-b5209fbf240f>

<https://nc.discoveryeducation.com/player/view/assetGuid/561b1cb7-dd13-4998-bcc9-71628c10f732>

<https://nc.discoveryeducation.com/player/view/assetGuid/f8df99bc-fc84-401e-ade6-466e52500f26>

Crime Scene Setup Links

http://www.theforensicteacher.com/crime_scene.html

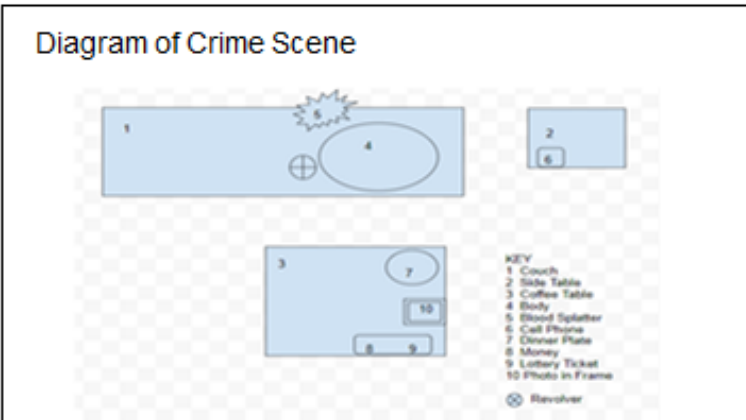
<https://englishteaching101.com/csi-classroom-activity/>

<https://kenanfellows.org/kfp-cp-sites/ddd/sites/default/files/mock-crime-scene.pdf>

<https://classroom.synonym.com/set-up-mock-crime-scene-5450056.html>

Lesson 2 Printable Resources

Picture and Diagram for VTS part of lesson (Copied from slide presentation used in presentation of unit lessons.)



Lesson 2 Slide Presentation: Who Did It?



Who Did It?

A.S.P.I.R.E. 2018

Manda Jackson
RMS 8th Grade Science



Victim

Frank Jackson Age 28

Math teacher in 8th grade at school

Killed while he was doing his lesson plan alone in his room.



Police Report

Time and place: July 12, around 9 pm at School, Room 167

Suspects: David Smith – Frank's colleague | Scarlet Reid – Frank's girlfriend | John Bruno – the security guard

There was a witness who saw them at the school around the 7:30 pm on the same day.

Witness



Beatrice Cook -- Head Custodian at the school.

Witness stated that she saw all suspects enter the school at or before 7:30 pm.

She saw Frank Jackson working in his room prior to her leaving at 7:30pm. She had made her final rounds of the school and was letting him know she was leaving and that the only one at that time that should have been left in the school was the Security Guard, John Bruno.

At that time, Mr. Jackson was not alone. He was having takeout dinner with his girlfriend, Scarlet Reid. Ms. Cook stated that it was none of her business, but that she didn't like his girlfriend. She thought she was not good enough for Mr. Jackson because in her words, she did not appreciate how good he was to her. She was actually shocked that she took time to come by the school to bring him dinner. Usually Mr. Jackson is running out to meet Miss Reid somewhere for dinner. Every time she has seen Miss Reid, she stated that she never has anything positive to say about the school or the job Mr. Jackson has here.

Witness account continued....

When leaving the school, she went by the office to clock out as usual. She ran into Mr. Bruno, the security guard, who insisted on walking her out the door to lock up. She said that Mr. Bruno was very nice that way. When he comes in at night, he is very professional about making sure who is in the building and that they check out with him prior to leaving. Ms. Cook let him know that the only people she had seen left in the building was Mr. Jackson and his girlfriend Miss Reid.

She said that Mr. Bruno seemed irritated with the mention of Miss Reid, because he stated that she had not checked in with him. He said that he would have to remind her and Mr. Jackson that all after hour visitors should check in with him prior to entering the building.

When Mr. Bruno was escorting her out, they encountered Mr. Smith, an English teacher at the school. Mr. Smith is an exchange teacher from Nottingham, England. He is a very cute young man, and trying to start a cricket team at the school. She does not know why though, because this is baseball country. Not England.

She stated that Mr. Smith stressed that he needed to get back into the school to get his power cord for his computer. Mr. Bruno gave him access in and watched her go to her car. At that time she left the school. It was round 7:45 pm.

Suspect 1



David Smith -- English Teacher from Nottingham England Age: 24

Mr. Smith is in the U.S. as an exchange teacher for on a three year working visa. He currently teaches 8th grade, the same as the victim. He recently moved to the U.S. in early April. He started working at the school in June.

Mr. Smith was a Cricket (<https://en.wikipedia.org/wiki/Cricket>) player in college (at Oxford University) and is wanting to start a team at the school. Evidently, he is not getting much support for the new game to the area even though Mr. Smith seems to be a very charismatic person.

Suspect 1: Interview



What time did you come to the school? Around 7:30pm

Why did you come to the school? To get my power cord for my computer.

Did you see anyone when you were at the school? Mr. Bruno was escorting Ms. Cook out to her car. I didn't see anyone else.

How many cars were in the parking lot? Uh? I don't know. I didn't notice. I just need the power cord so that I could get my syllabus turned in to the principal before school starts next week. Sorry, but that was my focus.

What time did you leave the school? Uh? I don't know, I got to my room and remembered I needed to label my tables for the following day of school, so I took time to do that, then I remembered I was getting a new student, and that messed the whole arrangement up. I had to redo it about three times to get it right. Then I left.

Suspect 2



John Bruno -- Security Guard at school Age: 28

Currently has worked at the school for the past four years.

Formerly, Mr. Bruno was a semi-pro baseball player. He played with a local team in North Carolina prior to a career ending knee injury. He has had several different jobs since leaving baseball. This is the first job he has been able to hold for more than a year.

Mr. Bruno has a criminal record in which he served 1 year probation for obtaining opioid medication without a prescription. He found this job after completing a two year rehabilitation program to battle his addiction to pain medication. (All related to knee injury).

Mr. Bruno has never traveled outside the U.S..

Suspect 2: Interview

What time did you come to the school? I always arrive for work at 4:30 pm when the secretary leaves for the day. I usually leave at 11:00 and set the alarm.

How many cars were in the parking lot when you escorted Ms. Cook to her car? five

Did you see anyone when you were at the school? I escorted Ms. Cook out to her car round 7:30 or so. I also let Mr. Smith in about the same time. Ms. Cook had told me Mr. Jackson and his girlfriend were still in the building. I had not seen them. I was making my rounds to check all doors and windows in the building, when I found the body of Mr. Jackson in his room around 9 pm.

Why did it take you so long to find his body if you were going to talk to him after you escorted Ms. Cook from the school? Well, I don't like confrontation and I don't like his girlfriend. So, I decided to check upstairs and downstairs and check everything else prior to checking the 8th grade hall heading back to the office. When I was checking the locker rooms downstairs, I found the football team had stopped up one of the drains in the showers and left the water on. So, instead of calling back in a custodian, I mopped up the mess. I forgot they were in and out due to summer practice starting just the other day.

Suspect 3



Scarlet Reid -- Girlfriend of Frank Jackson Age: 23

Miss Reid has been dating Mr. Jackson since May.

She is the daughter of a prominent lawyer in town. Her family sent her to Oxford University for one year of college as part of a international exchange student program following three years at UNC. She had recently returned from England in April when she was introduced to Mr. Jackson at a school fundraiser right before Mother's Day in May.

Miss Reid contributes much of her time to social projects in their town. She is on several volunteer committees and is currently employed by a local business to be their International Relations Officer. Which means, that it is her job to travel to recruit markets for their product internationally. She speaks three languages (English, French, and Spanish).

Suspect 3: Interview

What time did you come to the school? I guess I got to the school with dinner for Frank and I around 6:45 pm.

Why did you come to the school? Like I said, to bring Frank dinner.

Did you see anyone when you were at the school? No, just Frank and that custodian lady. I don't think she like me bringing him dinner at the school. She said something about not suppose to have food in the rooms. It causes bugs or something. I didn't really listen to whatever she said.

How many cars were in the parking lot? I don't know. I was calling Frank to let me in the side door and trying not to drop our dinner. You know it really hot out there in the parking lot waiting. I didn't notice what cars were there.

What time did you leave the school? Oh! Uh? I left shortly after bringing Frank dinner. My dinner was making me sick, I had a migraine headache all day.

TEACHER NAME			Lesson #
Manda Jackson			3
MODEL	CONTENT AREA	GRADE LEVEL	
Socratic Seminar	Science	7-12	
CONCEPTUAL LENS		LESSON TOPIC	
Perseverance		Forensic Science	
LEARNING OBJECTIVES <i>(from State/Local Curriculum)</i>			
Grade 8 – 8.L.2 Understand how biotechnology is used to affect living organisms 8.L.2.1 Summarize aspects of biotechnology 8.L.1 Understand the hazards caused by agents of diseases that affect living organisms. 8.L.1.1 Summarize the basic characteristics of viruses, bacteria, fungi and parasites relating to the spread, treatment and prevention of disease. 8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease. 8.L.4.1 Summarize the use of evidence drawn from geology, fossils, and comparative anatomy to form the basis for biological classification systems and the theory of evolution.			
Grade 7— 7.L.1 Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life. 7.L.1.4 Summarize the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, and excretion) and ways that these systems interact with each			

other to sustain life.

HS Biology—

Bio.3.3.1 Interpret how DNA is used for comparison and identification of organisms.

Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology

Forensics--

For 1.1 Understand that inquiry is the integration of process skills, the application of scientific content, and critical thinking to solve problems

Crime Scenes & Criminal Law—

For 2.1.1 Describe the procedures used to secure a crime scene

For 2.1.2 Apply the use of search grids for evidence collection

For 2.1.3 Diagram and photograph crime scenes

THE ESSENTIAL UNDERSTANDING <i>(What is the overarching idea students will understand as a result of this lesson?)</i>	THE ESSENTIAL QUESTION <i>(What question will be asked to lead students to “uncover” the Essential Understanding)</i>
Perseverance shapes Problem Solving	How does perseverance shape problem solving?
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	PROCESS SKILLS (What will students be able to do as a result of this lesson?)
Students will know THAT.... • There are different types of evidence in a crime scene • There are different procedures for collecting different types of evidence • Evidence locations are relevant in relation to collection procedures	Students will be able to: • Collaborate • Generalize • Investigate • Analyze

GUIDING QUESTIONS

What questions will be asked to support instruction?

Include both “lesson plan level” questions as well as questions designed to guide students to the essential understanding

Pre-Lesson Questions:	During Lesson Questions:	Post Lesson Questions:
• How is forensics science related to archeology? • How can scientist use current information to make generalizations about events from the past? • What is perseverance? • Why is perseverance important in crime scene investigation? • What do we do when we investigate? • What does investigation involve? • Why do forensic scientists investigate? • Is investigation part of problem solving, if so, why? • Why is perseverance necessary in problem solving?	• How are you going to document evidence at our crime scene? • What evidence do we observe? • How can we document our evidence? • How can we represent our evidence in relation to other evidence in our crime scene? • Why do we document location of the evidence within the crime scene? • What does evidence have to do with investigation or problem solving?	• What evidence led you to determine who stole the horse from Red Rock Ranch? • What problem had to be solved? • What background knowledge did you need to have to make your connections? • How does perseverance shape problem solving?

DIFFERENTIATION

(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.

Content	Process	Product	Learning Environment
Scientific relative vocabulary is embedded in articles and class discussion.	Socratic Seminar	Uniqueness of each student product for performance task. Students have choice and produce a product that is unique to their skills and indicates their readiness.	Socratic seminar allows for student movement between turns for sharing information. (Outside circle switches with inside circle at halfway).

PLANNED LEARNING EXPERIENCES

(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

Engage and Connect -- *This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.*

- *Hook: Can you find the differences? Students compare two pictures and identify differences in the pictures. This is practice in details. (Sciencespot.net – Spot the Differences <http://sciencespot.net/Pages/classforscistarters.html>)*
- *Students are given three specific texts from Discovery Education: Forensics, Digging for Information, Mystery at Red Rock Ranch.*
- *Teacher reviews process of Socratic seminar. I will play a video that explains how the process works (<https://youtu.be/495Bu1Ybk4A>).*
- *Teacher will review duties of inner circle and duties of outer circle. Teacher will go over procedure for prior, during seminar, and post seminar.*

Explore – *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

- **Students will be given time to read all three articles.**
- **Students will be asked to number paragraphs for reference, highlight or underline important information, note unknown words, and make personal note on text as they read.**
- **Students will form inner/outer circle for seminar**
- **Teacher will pose students with content question: How does perseverance shape problem solving?**
- **Inner circle will discuss articles read and pose questions about the articles that they would like to know more information about or vocabulary. Inner circle will continue to try and answer concept question.**
- **Outer circle will take notes on comments made by person directly in front of them. They will note the strongest point made by their person. (Students will be given a graphic organizer to use.)**
<https://drive.google.com/open?id=1IQWhC3WeEhKn1XIBrVgbhaycVCEfUXB->

- **Switch outer and inner circles and jobs. Continue to attempt to answer concept question.**

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

- **Students will have group discussion after exploring information brought up during Socratic seminar. (What questions did they bring up in discussion? How are these questions related to perseverance or problem-solving? How are the questions we still have going to assist us in solving our problem in this lesson?)**
- **Students will share inner group with outer group behind them. They will share important information that was given by each that was observed by the other student. Students will comment on what they felt was the strongest statement given by that student while in inner circle.**
- **After brief discussion as inner/outer circle, have whole group discussion as class with teacher on concept question.**

Elaborate —*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways*

- *Students will write a reflection of what was discussed in seminar including any new questions that arose in their discussions with inner and outer circle pairs.*
 - *Reflection will make note of positive points, negative points, and unanswered questions still remaining.*
- *What connections do these articles have on “How does perseverance shape problem solving?”*
 - *Who does the class think stole the horse from Red Rock Ranch?*
 - *Why? What evidence supports your conclusion? What background knowledge did you need to have to make your connections?*

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

- **Ticket out the Door: What was the evidence that convinced you who was the person that stole the horse from Red Rock Ranch?**
- **For assessment of this unit, students will complete a performance task. Instructions for the performance task are listed below:**

Performance Task: Who did it?

You are a crime scene investigator with the local sheriff's department. Your challenge is to collect evidence relevant to a recent murder case in the county and submit your findings to the local district attorney (teacher). This information will be presented to a grand jury for indictment of the chosen criminal.

You will create a portfolio that must include personal data on each suspect, picture of each suspect, interview notes from each suspect, and a list of any evidence linked to the suspect found at the crime scene. Through your assembly of a crime scene portfolio, you will need to include a summary of your findings for each suspect and a recommendation to the district attorney on whether to seek arrest or not with each suspect. You will present your evidence from your portfolio to the grand jury (class), who will decide on indictment of the suspect.

Resources:

Forensics. [Reading Passage]. Available from <http://www.discoveryeducation.com>

<https://app.discoveryeducation.com/learn/player/32158963-2876-437c-840a-55e7638a5c67>

Digging For Information. [Reading Passage]. Available from <http://www.discoveryeducation.com>

<https://app.discoveryeducation.com/learn/player/be8851b5-5396-4eef-8f53-3793f6ba25fb>

The Mystery at Red Rock Ranch. [Reading Passage]. Available from

<http://www.discoveryeducation.com>

<https://app.discoveryeducation.com/learn/player/ff59c4d1-ceec-4214-8e52-05f06586bf0a>

<https://gtm-media-3.discoveryeducation.com/v3.2/DSC/data/AnswerKey.pdf>

The reading passages for lesson three must be accessed through the links within the lesson. The format of the resources will not allow me to include the resource in their full view within this unit description. Below are sample screenshots of the first page of each reading passage and answer key, as well as screenshots of the graphic organizer and google form used as an exit ticket for this lesson.



Forensic Science Starters

Daily CSI Challenges

I created Daily CSI Challenges for this class to target observation and problem solving skills as well as incorporate trivia to review class material or highlight historical cases and people. Students use a [Daily CSI bookmarks \(PDF\)](#) to record their answers and I grade the bookmarks at the end of each week. I organize these into weekly folders on my computer to make it easier to find the ones I want to use. You can also rename the files and add the day of the week to the file name to help you organize them to fit your class schedule. See the [sample schedule](#) for a list of starters I use each week.

General Challenges

Includes word scrambles, scientists, mystery pictures, and more. I usually do one of these each week on Mondays.

Titles:

[Penry Challenge](#)

[Scramble 1](#), [Scramble 2](#), [Scramble 3](#), [Scramble 4](#)

[Scientist 1](#), [Scientist 2](#)

[Mystery Pictures 1](#), [Mystery Pictures 2](#)

[Name That Organization 1](#), [Name That Organization 2](#)

Spot the Differences

Students analyze two photographs or images to identify differences between them. I usually do two of these each week on Tuesdays and Thursdays.



Forensics
READING PASSAGE 1,280 Views

Page 1 of 2

Forensics

Ardeche, France, June 10, 1995

Archaeologists came across four footprints hardened in the deep clay floor of Chauvet, an ancient cave near Ardeche, France. They determined that a boy about eight years old, standing 4½ feet (1.3 m) tall, left the prints about 25,000 years ago.

How did they know? The scientists determined the child's gender and height because they knew the footprints—8 inches (20 cm) long and 3½ inches (9 cm) inches wide—were a typical size for an average modern-day eight-year-old boy. And the prints' indentations and slant marks told them that the boy was walking, not running.



Digging For Information
READING PASSAGE 155 Views

Page 1 of 2

Digging For Information

In many ways, forensics and archaeology go hand in hand.

In seeking criminals, forensics investigators use the same techniques—analyzing DNA, bones, and personal belongings—archaeologists use to learn about the past. So advancements in forensics-based investigative techniques often help archaeologists.

When scientists dig up a body, one of the most important things they need to know is how old it is. They get their answer using radiocarbon dating. Every living organism contains carbon, some of which—carbon 14—is radioactive and decays over time.

Jamestown, Virginia
Historians and archaeologists have been searching for evidence of England's first American colony for years. In 1984 members of the Association for the Preservation of Virginia Antiquities uncovered burnt pieces of wood dating back to sometime in the late 1500s or the early 1600s. A massive fire occurred in Jamestown in 1609, and the pieces of wood were prime evidence. Also, careful analysis of two skeletons revealed their ages, heights, race, and gender, which linked them to records of two settlers of the colony.

Southwest corner of Colorado
Recent discoveries of Anasazi Indian.



The Mystery at Red Rock Ranch
READING PASSAGE 18,585 Views

Page 1 of 2

Trouble at Red Rock Ranch

As Sheriff Clay Banks drove through the gate of the Red Rock Ranch, he could see a cloud of dry red dust billowing up behind the jeep as the reactive mirror. Down the road, Rock Fielding waited patiently for his arrival at the ranch house.

"Thanks for coming out so early," Rock Fielding said, offering the sheriff a freshly brewed cup of coffee. "Not a problem, Rock. I'm normally up at the crack of dawn anyway," smiled Clay Banks. "So what's this about your prize stallion being rustled away in the night?"

"I don't think it happened more than two or three hours ago. I heard the dogs barking at about 3 a.m., and I thought it was just coyotes. But when I got up this morning, Valiant was gone."

"Mind if we take a look at the stables?" asked Sheriff Banks.

"Well, as a matter of fact, just last week I turned down three offers to sell him. Frankly, Valiant is worth a lot more than the offers I got."

"Looks like we've got something here," Sheriff Banks said suddenly, pointing to some footprints near the stables. He measured the length and width of each print. Then he scooped up a soil sample and sealed it in a plastic bag. "The dirt back here looks a lot richer than out front," the sheriff remarked, noticing a few blades of grass mixed in with the soil.

"Yes," Rock said proudly. "Horse manure makes great fertilizer for my little vegetable plot. I try to mix the manure with the dirt that's close to the stream. It's not great, but it's better than the other dry rocky stuff around here."

"Tell me, who made beds out Valiant? Did like to see any more?"

Discovery EDUCATION

Answer Key: Trouble at Red Rock Ranch

Answer: Sample #3

When Sheriff Banks visits Dusty Grimes, Mr. Grimes reports that he had been unloading hay for the past two days. In the soil samples though, Sheriff Banks finds traces of darker soil and organic matter that match the soil description at Red Rock Ranch.

Socratic Seminar Notes

Name: _____

Things the Inner Circle Talked About:

Things the Inner Circle Did **Not** Talk About:
(I can ask about these things!)

Notes on *TITLE OF TEXT HERE*:
(I can study from this later!)

QUESTIONSRESPONSES

Exit Ticket 7/18/18

Form description

Email address *

Valid email address

This form is collecting email addresses. [Change settings](#)

Who does the class think stole the horse from Red Rock Ranch? *

Short answer text

Why? What evidence supports your conclusion? What background knowledge did you need to have to make your connections? *

Long answer text

+

Tt

TEACHER NAME			Lesson #
Manda Jackson			4
MODEL	CONTENT AREA	GRADE LEVEL	
CPS—Creative Problem Solving	Science	6-9	
CONCEPTUAL LENS		LESSON TOPIC	
Perseverance		Forensic Science	
LEARNING OBJECTIVES <i>(from State/Local Curriculum)</i>			
Grade 8 – 8.L.2 Understand how biotechnology is used to affect living organisms 8.L.2.1 Summarize aspects of biotechnology 8.L.1 Understand the hazards caused by agents of diseases that effect living organisms.			

- 8.L.1.1 Summarize the basic characteristics of viruses, bacteria, fungi and parasites relating to the spread, treatment and prevention of disease.
- 8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease.

8.L.4.1 Summarize the use of evidence drawn from geology, fossils, and comparative anatomy to form the basis for biological classification systems and the theory of evolution.

Grade 7—

7.L.1 Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life.

- 7.L.1.4 Summarize the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, and excretion) and ways that these systems interact with each other to sustain life.

HS Biology—

Bio.3.3.1 Interpret how DNA is used for comparison and identification of organisms.

Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology

Forensics--

For 1.1 Understand that inquiry is the integration of process skills, the application of scientific content, and critical thinking to solve problems

Crime Scenes & Criminal Law—

For 2.1.1 Describe the procedures used to secure a crime scene

For 2.1.2 Apply the use of search grids for evidence collection

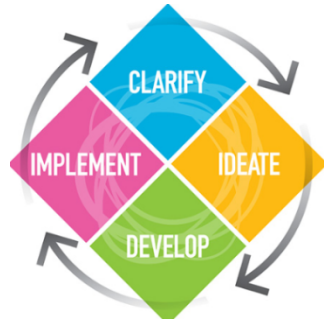
For 2.1.3 Diagram and photograph crime scenes

THE ESSENTIAL UNDERSTANDING <i>(What is the overarching idea students will understand as a result of this lesson?)</i>		THE ESSENTIAL QUESTION <i>(What question will be asked to lead students to “uncover” the Essential Understanding)</i>	
Perseverance shapes Problem Solving		How does perseverance shape problem solving?	
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)		PROCESS SKILLS (What will students be able to do as a result of this lesson?)	
Students will know THAT.... • There are different types of evidence in crime scene • Procedures for collecting different types of evidence must be followed • Understanding location of items in a crime scene relates to the investigation.		Students will be able to: • Collaborate • Generalize • Investigate • Analyze • Problem-Solve • Persevere	
GUIDING QUESTIONS <i>What questions will be asked to support instruction?</i> <i>Include both “lesson plan level” questions as well as questions designed to guide students to the essential understanding</i>			
Pre-Lesson Questions:		During Lesson Questions:	Post Lesson Questions:

• How do the quotes in this image make you feel? • How are these quotes related to our crime scene investigation? • What is perseverance? • Why is perseverance important in crime scene investigation? • What do we do when we investigate? • What does investigation involve? • Why do forensic scientists investigate? • How is investigation part of problem solving?	• How are you going to document evidence from our crime scene? • What evidence did we observe? • How can we document our evidence? • How can we present our evidence from our crime scene to others? • Why do we document location of the evidence within the crime scene? • What does evidence have to do with investigation? • What does evidence have to do with problem solving?	• What problem had to be solved? • Was all evidence relevant to our case? • What background knowledge did you need to have to make your connections to solve this problem or case? • How does perseverance shape problem solving?	
DIFFERENTIATION (Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.			
Content	Process	Product	Learning Environment

Scientific appropriate vocabulary.	Student choice of resources or use of technology to create portfolio of information for presentation of performance task.	Students will produce unique and/or original product for unit performance task based on student readiness.	Observation of crime scene as needed. (Students are mobile from room to crime scene.)
PLANNED LEARNING EXPERIENCES <i>(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)</i>			

Engage and Connect - *This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.*
Creative Education Foundation



“The best way to have good ideas is to have lots of ideas... and then throw the bad ones away.”

~Linus Pauling

“Creativity takes courage.”

~Henry J. Kaiser

“Of all the gifts we have as humans, the one that stands out, giant-like above all the rest, is our ability to be creative. It is responsible for all the progress we enjoy today.”

~Sidney Parnes

“Learn the craft of knowing how to open your heart and to turn on your creativity. There’s a light inside of you.”

~Judith Jamison

To begin this lesson, I will show the above image and four quotations from CPS website. I will ask students, “How do these quotes make you feel?” “How are these quotes related to our lessons this week?” We will use class discussion to explain the process of CPS

- **Brainstorming**

- **Divergent Thinking**
- **Convergent Thinking**

Watch brief video of CPS Model: <https://youtu.be/QbxyiUG5RRI>

Incorporate pre-lesson questions within discussions.

Explore - *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

CLARIFY—State our problem. State evidence found at crime scene. Document all facts relevant to case per group. This is the brainstorming part of the lesson. Student list any and everything related to what we have learned this week and at our staged crime scene. Students can also reference any information from the lessons or discussions from previous classes this week. At this point, all information is relative.

IDEATE—This is where we dive into divergent thinking in relation to our crime scene and performance task. All solutions are relevant. All evidence is included. All background information is considered. All possible solutions are considered. Then we move to convergent thinking and we start to eliminate irrelevant information. Narrow down the information to what we need to solve our problem. This reinforces our essential understanding: Perseverance shapes Problem Solving.

(During Lesson Questions to be included within discussions of divergent and convergent thinking.)

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

DEVELOP—Here we will develop our performance task and narrow down our answer to “WHO DID IT?” Students will develop their portfolio or solution to the performance task. They will use evidence from our lessons and staged crime scene to conclude who is the correct suspect.

Elaborate —*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways*

IMPLEMENT—Students will finish their performance task in groups and then present their solution and why they have chosen to present the information in the way of their choice.

Students and teacher will discuss post lesson questions. Students should be able to justify their own reasoning for: Why does perseverance shape problem solving?

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

- **For assessment of this unit, students will complete a performance task. Instructions for the performance task are listed below:**

Performance Task: Who did it?

You are a crime scene investigator with the local sheriff’s department. Your challenge is to collect evidence relevant to a recent murder case in the county and submit your findings to the local district attorney (teacher). This information will be presented to a grand jury for indictment of the chosen criminal.

You will create a portfolio that must include personal data on each suspect, picture of each suspect, interview notes from each suspect, and a list of any evidence linked to the suspect found at the crime scene. Through your assembly of a crime scene portfolio, you will need to include a summary of your findings for each suspect and a recommendation to the district attorney on

whether to seek arrest or not with each suspect. You will present your evidence from your portfolio to the grand jury (class), who will decide on indictment of the suspect.

Below is a screenshot of a video resource used in the fourth lesson of this unit.

CPS Model video:



Unit Resources

Textbook Resources:

Karnes, F. A. & Stephens, K. R. *Achieving excellence: Educating the gifted and talented*. Upper Saddle River, NJ: Pearson Merrill Prentice Hall.

Erickson, H. L., Lanning, L. A. & French, R. (2017). *Concept-based curriculum and instruction for the thinking classroom* (2nd ed). Thousand Oaks, CA: Corwin.

Stephens, K. R. & Karnes, F. A. (Eds.). (2016). *Introduction to curriculum design in gifted education*. Waco, TX: Prufrock Press Inc.

Wiggins, G. & McTighe, J. *The understanding by design guide to creating high quality units*. Alexandria, VA: ASCD.

Resources from Concept Paper:

Investigation, (n.d.). In *Merriam-Webster Dictionary Online*. Retrieved from <https://www.merriam-webster.com/dictionary/investigate>

Forensic Science, (n.d.). From Wikipedia Online Encyclopedia. Retrieved from https://en.wikipedia.org/wiki/Forensic_science

Perseverance, (n.d.). In Merriam-Webster Dictionary Online. Retrieved from <https://www.merriam-webster.com/dictionary/perseverance>

Travis, J., & Rau, R. (2000, January). *Crime Scene Investigation: A Guide for Law Enforcement*. Retrieved from <https://archives.fbi.gov/archives/about-us/lab/forensic-science-communications/fsc/april2000/twgsi.pdf>

Article Resources from Lessons:

Schiro, G. (n.d.), Collection and Preservation of Evidence, *Crime Scene Investigator Network*. Retrieved from <http://www.crime-scene-investigator.net/evidenc3.html>

Willing, R. (20014, August 5). 'CSI effect' has juries wanting more evidence. *USA TODAY*. Retrieved from https://usatoday30.usatoday.com/news/nation/2004-08-05-csi-effect_x.htm

The History of Fingerprints. (2018). STEMWORKS website created by Southern Methodist University. Retrieved from <http://stem-works.com/subjects/3-forensics>

Forensic Facial Reconstruction (n.d.). Smithsonian—National Museum of Natural History. Retrieved from https://anthropology.si.edu/writteninbone/facial_reconstruction.html

Sweet, K. (n.d.). How to Set up a Mock Crime Scene. *Classroom.synonym.com*. Retrieved from <https://nc.discoveryeducation.com/learn/player/f8df99bc-fc84-401e-ade6-466e52500f26>

Stephens, C. & M. Feil. (n.d.). How to Set Up a Crime Scene. *Theforensicscienceteacher.com*. Retrieved from http://www.theforensicteacher.com/crime_scene.html

Forensics. [Reading Passage]. *Discovery Education*. Retrieved from <https://app.discoveryeducation.com/learn/player/32158963-2876-437c-840a-55e7638a5c67>

Digging For Information. [Reading Passage]. *Discovery Education*. Retrieved from <https://app.discoveryeducation.com/learn/player/be8851b5-5396-4eef-8f53-3793f6ba25fb>

The Mystery at Red Rock Ranch. [Reading Passage]. *Discovery Education*. Retrieved from <https://app.discoveryeducation.com/learn/player/ff59c4d1-ceec-4214-8e52-05f06586bf0a>

The CPS Process. (2018). *Creative Education Foundation*. Retrieved from <http://www.creativeeducationfoundation.org/creative-problem-solving/the-cps-process/>

Website Resources from Lessons:

<http://www.sciencemystery.com/> This website gives students choices of different mysteries to solve. Each case has information to read and choices to make in order to determine the answer to the mystery.

<http://sciencespot.net/Pages/classforsci.html#CSIadventure> The Science Spot is a good website for middle school educators. This page links to topics related to forensic science lesson plans.

<https://www.forensicscolleges.com/usa/north-carolina> This website helps students explore college options in forensic science. Students can also explore careers related to forensic sciences.

<https://www.wsfcs.k12.nc.us/site/Default.aspx?PageID=77752> This site was used as a teacher resource. The website offers course descriptions related to forensic science available at Atkins High School in the Winston-Salem/Forsyth County Schools in North Carolina.

<https://www.abss.k12.nc.us/Page/11720> This site was used as a teacher resource. The website offers course information related to forensic science available at Wester Alamance High School in the Alamance-Burlington School System in North Carolina.

<https://oucc.dasa.ncsu.edu/forensic-science-17fscm/> This is a reference site for teacher and students. This website lists a description of course and course requirements related to forensic sciences at North Carolina State University in Raleigh, NC.

<http://www.ncdoj.gov/crime-lab.aspx> North Carolina Department of Justice—Crime Lab. This website lists information for the crime lab such as how the crime lab helps to solve crimes, it is internationally accredited, how to seek employment, and seek internships. This site can be used as a student resource for those seeking career interest in a related science field.

<http://stem-works.com/subjects/3-forensics> This website contains articles and activities related to forensic sciences. It is part of the STEMWORKS site created by Southern Methodist University (2018).

<http://stem-works.com/external/activity/6> This website allows students to take a virtual tour of three different crime labs (Drug/chemistry Lab, Firearms/Tool Marks Lab, and Forensic Biology Lab).

<http://forensics.rice.edu/> This website is game based. It was created by Rice University and based on the CSI Crime show as its base. This game allows students to go through investigation simulations and participate in learning information they will need to solve the crime.

https://www.researchgate.net/figure/The-Four-Step-Forensic-Process-FSFP-after-Kent-et-al-2006_fig3_258224615 This website was used to reference the graphic organizer for The Four Step Forensic Process.

http://documents.routledge-interactive.s3.amazonaws.com/9781455731381/student/content/Crime_Scene_Simulation/activity.html This website is a crime scene simulation. It allows students to make choices based on observed evidence. If incorrect, it allows them to make other choices. The correct choice will lead to more information and solving of the crime. It is great for pointing out relevant information in a crime scene.

<https://www.cbs.com/shows/ncis-new-orleans/> NCSI: New Orleans (CBS) This site is part of the CBS Network and allows you to watch past NCSI: New Orleans shows that have previously aired on TV.

<https://kenanfellows.org/kfp-cp-sites/ddd/sites/default/files/mock-crime-scene.pdf> This is a PDF of a Mock Crime Scene Final Lesson. Used as a teacher reference.

<http://sciencespot.net/Pages/classforscistarters.html> Found at sciencespot.net under the subtitle: Spot the Differences. This link was used for an opener activity in lesson 3. Any of the activities can be selected based on the class.

Video Resources from Lessons:

Animating Watson and Crick. *Discovery Education*. Retrieved from <https://nc.discoveryeducation.com/learn/player/561b1cb7-dd13-4998-bcc9-71628c10f732>

Solving Crimes with Forensic Science. *Discovery Education*. Retrieved from <https://nc.discoveryeducation.com/learn/player/37a001e9-3014-499d-9407-b5209fbf240f>

Science Investigations: Physical Science: Investigating Chemical Properties (Full video). *Discovery Education*. Retrieved from <https://nc.discoveryeducation.com/learn/player/f8df99bc-fc84-401e-ade6-466e52500f26>

14 Amazing Forensic Science Techniques. YouTube. Retrieved from <https://www.youtube.com/watch?v=g7KCFpALTrI>

Forensic Science Timeline. YouTube. Retrieved from <https://www.youtube.com/watch?v=epRcZL1K12Y>

What is Forensic Science. YouTube. Retrieved from https://www.youtube.com/watch?v=_58XsN6XJWQ

The Real Science of Forensics. YouTube. Retrieved from <https://www.youtube.com/watch?v=h3-Pj-zbEq8>

SciShow YouTube Channel Page. YouTube. Retrieved from https://www.youtube.com/user/scishow?disable_polymer=true

Socratic Seminar Introduction. YouTube. Retrieved from <https://www.youtube.com/watch?v=495Bu1Ybk4A&feature=youtu.be>
This video was used as part of engagement in lesson 3 to introduce Socratic Seminar process to students. This is helpful if students have never participated in a seminar situation before.

What is Creative Problem Solving? YouTube. Retrieved from <https://www.youtube.com/watch?v=QbxyiUG5RRI&feature=youtu.be>

Other Resources from lessons:

Who Did It? Concept developed from original creator of: Mysterious Murder of Ben Johnson; Story adapted from original. Retrieved from <https://englishteaching101.com/csi-classroom-activity/>

Bernardo, B. (2017, March 2). CSI Classroom Activity: Staging a Crime Scene. *English Teaching 101 class website*. Retrieved from <https://englishteaching101.com/csi-classroom-activity/>

This rubric was used for creation of crime scene map in lesson 2. The rubric was created using RubiStar website. https://drive.google.com/file/d/1hnAYTJmli99kaXzxeKfbhXT_RZhNCsOg/view?usp=sharing

Graphic organizer to be used with Lesson 3: Socratic Seminar. Retrieved from <https://drive.google.com/file/d/1lQWhC3WeEhKn1XIBrVgbhaycVCEfUXB-/view>

Answer Key to Mystery at Red Rock Ranch. *Discovery Education*. Retrieved from <https://gtm-media-3.discoveryeducation.com/v3.2/DSC/data/AnswerKey.pdf>

Website created by Manda Jackson with use of Google Sites for instruction of unit lessons. <https://sites.google.com/rock.k12.nc.us/mrsjacksonaspire2018/home>

Components	Does Not Meet Standard	Sometimes Meets Standard	Meets Standard	Exceeds Standard	Score
Introduction (5)	Rationale and population description are not present (0)	Rationale and population description are incomplete (1-2)	Rationale and population are adequately defined (3-4)	Rationale and population are clearly defined and supported with pertinent data (5)	5
Goals & Outcomes (5)	Goals and Outcomes are not present (0)	Goals and Outcomes are incomplete (1-2)	Goals and Outcomes are adequately presented (3-4)	Goals and Outcomes are clearly presented and appropriate for gifted learners (5)	5
Assessment Plan (5)	An assessment plan is not included (0)	An evaluation plan is included, but is incomplete. (1-2)	An adequate evaluation plan is included (3-4)	A well-developed evaluation plan is presented (5)	5
Lesson Plans (30)					
General (5)	No lesson plans are included (0)	Lesson plans are included, but are incomplete, do not encompass 10 hours of instruction, do not include all elements, or are not appropriate for the gifted. (1-2)	Lesson plans are included and adequately cover 10 hours of instructional time, include most/all elements, and are adequately differentiated for the gifted. (3-4)	Lesson plans are included that are clear and creative, encompass 10 hours of instruction, include all elements, and are appropriately differentiated for the gifted. (5)	5
	A concept(s) for the unit is not identified (0)	A concept(s) is identified, but is not adequately connected to the content of the	A concept(s) is identified that is appropriately connected to the content of	A concept(s) is identified that strongly connects to the content of the unit as demonstrated through well articulated big	10

Conceptual Lens (10)		unit. Inconsistent focus throughout lessons. May diverge from original concept. (1-7)	the unit. The concept remains the focus throughout most of the unit. (8-9)	ideas/essential understandings. Each lesson revisits the concept and fosters deeper student understanding of the concept (10)	
	Lesson activities do not include a “hook” to engage students. (0)	A few of the lessons include details for engaging and/or “hooking” the students. (1-7)	Many of the lessons include “hooks” to engage students. Lesson activities are student-centered and encourage active participation by students. (8-9)	Every lesson begins with an engaging “hook” to focus students. Activities are incorporated throughout the unit to foster active participation by students. (10)	10
Student Engagement (10)	No evidence of questioning within plans (0)	A few of the lessons have planned questions, but limited in depth and complexity, are not connected to the conceptual lens, and/or do not require higher level thinking. (1-2)	Many of the lessons include planned questions that are appropriate for gifted learners and help students explore the identified concept(s). (3-4)	Questions are included in every lesson plan. Planned questions require higher level thinking and engage students in rich discussions of the identified concept(s). (5)	5
Questioning (5)					
Performance Task (10)	Performance task with rubric is not included (0)	A performance task and rubric are included, but are incomplete. It is unclear how the task will allow students to demonstrate their understanding of identified concept, skills, and knowledge. The rubric may also lack clarity. (1-7)	An adequate performance task with rubric is included. It is evident that the teacher will sufficiently be able to determine students’ understanding of concept, skills, and knowledge through the planned task. (8-9)	A well-developed performance task is included that clearly allows students to demonstrate their understanding of the identified concept(s), mastery of identified skills, and knowledge of content. The task is paired with a well-articulated, clear rubric for assessing student performance/knowledge/skills (10)	5 There is no rubric for the performance task.
Unit Resources (5)	References not included (0)	An incomplete list of references is included (1-3)	An adequate list of references is included (4)	A comprehensive list of references is included in appropriate APA format with annotations.(5)	5
TOTAL					

Total: 55/60

Manda Jackson

Comments: Your unit is designed to be informative and highly engaging for students. You have included amazing resources, including videos and articles. Your creativity is evident. Good work!