

Assignment Discovery Online Curriculum

Lesson title:

Forensic Detectives: Who Did It?

Grade level:

6-8

Subject Area:

Forensic Science, Chemistry

Duration:

Two or three class periods

Objectives:

Students will do the following:

1. Explore how forensic science is used in criminal investigations
2. Apply the principles of forensic science to a hypothetical crime
3. Use the scientific process to solve a fictional crime

Materials:

- Newsprint and markers
- Plastic bags (one for each student)
- Adhesive tape (for gathering thread sample)
- White paper
- A soft pencil
- Clear tape
- Microscopes or hand lenses
- Internet access (optional but very helpful)

Each student will supply the following:

- A hair sample
- A thread sample from their clothing

Procedures:

1. Before class begins, pick one student to be the perpetrator of a fictional classroom crime. Collect a hair sample, a thread sample, and a fingerprint from that person. (See Step 6 for instructions on how to obtain fingerprints.) This is the main evidence from the crime scene. Place the evidence in a plastic bag. Although the student you choose will participate in the activity with the rest of the class, it's important to choose

someone who will not reveal his or her role as the perpetrator during the two or three days of this lesson.

2. Tell students that during the next few days they will try to solve a “crime” that took place in the classroom. Make it clear to students that this is a simulation of a crime, not an actual event that took place. Tell them the story below. (Feel free to embellish the story, but stick to the basic elements of the crime.)

Last night, a crime was committed in our classroom. Someone ransacked the teacher’s desk, throwing supplies on the floor and taking some money hidden in one of the drawers. We have been lucky enough to gather evidence from the scene of the crime, which includes a fingerprint, a hair sample, and a thread from an article of clothing. The evidence has been placed in a plastic bag. Now it is up to all of us to try to solve the crime.

3. Show students the plastic bag of evidence. Then ask students how they would begin to solve this crime. How do they analyze the evidence discovered at the scene of the crime? Write students’ ideas on a piece of newspaper.
4. Tell students that the Federal Bureau of Investigation—the FBI—deals with serious crimes. While the classroom crime is much less serious than those the FBI usually deals with, students may be able to learn something about solving crimes by finding out how the FBI does it. Give students an opportunity to browse the FBI Web site at <http://www.fbi.gov/kids/6th12th/investigates/investigation.htm>.
5. If students haven’t already come to this conclusion, tell them that everyone in the class is a prime suspect in the crime because they all have access. The first step is to collect the same evidence from each student as that found at the crime scene. To begin the collection process, give each student a plastic bag. Tell students to place a hair sample and a thread from their clothing into the bag. (Have students use a piece of adhesive tape to pull a piece of thread off their clothing. Alternatively, students may snip a small thread from the inside of the clothing with a pair of scissors.)
6. Tell students that they must also submit fingerprints for analysis. Each student should follow the directions below:
 - a. Draw a dark pencil smudge on a piece of scratch paper.
 - b. Beginning with the little finger on your right hand, rub your fingers on the pencil smudge until they are covered.
 - c. Put a small piece of clear tape on the pad of your right thumb. Gently press the tape. Carefully remove the tape and place it on one edge of a clean sheet of paper.
 - d. Repeat the process for the remaining fingers on your right hand, placing the pieces of tape across the sheet of paper. Label each piece of tape with the following abbreviations:
 - T for the thumb

- I for the index finger
 - M for the middle finger
 - R for the ring finger
 - L for the little finger
- e. Then follow the same steps for your left hand.
 For more information on how to take fingerprints, check out the following Web site: <<http://school.discovery.com/lessonplans/programs/forensics/index.html>>.

7. After all students have collected the evidence, tell them to analyze it carefully. Ask students to use a microscope or a hand lens to observe each piece of evidence and record their findings on charts like those shown below. Each student will analyze their own evidence.

Strand of Hair

Characteristic	Observations
Color	
Length	
Other features	

Thread Sample

Characteristic	Observations
Color	
Size	
Texture	
Other features	

The FBI categorizes fingerprints by three different patterns: loops, arcs, and whorls. Pictures of these three types of fingerprints can be found at the following Web site: <http://members.tripod.com/adm/popup/roadmap.shtml?member_name=ani1299&path=vol_002_no_001&client_ip=152.163.188.165&ts=1002652258&ad_type=POPUP&id=1fb42737aed18db65e174dc65bd9705>. Tell students to use a hand lens or a microscope to determine their fingerprint type and then to record their results.

Fingerprint

Characteristic	Observations
Loop pattern	
Arc pattern	
Whorl pattern	

8. As students are analyzing their evidence, place the evidence from the crime scene in a prominent place. Have students mount their completed charts on a bulletin board. As a class, make observations about the criminal's evidence. Complete charts for the hair, thread, and fingerprints of the culprit, and post those completed charts on the bulletin board along with the others.

9. Ask students to compare the charts from their classmates with the evidence from the crime scene to determine who committed the crime. Have students write down who they think committed the crime, and discuss possible suspects. Were most students able to figure it out? Did the class reach a consensus? Which piece of evidence did they find the most revealing?

10. Conclude the lesson by discussing other techniques detectives use to collect and analyze evidence from a crime scene. What other evidence do they collect? What tools can they use to analyze evidence?

Discussion Questions:

1. What other physical evidence would have been helpful in determining who committed the crime in the classroom? What kinds of analysis could you do on the other pieces of evidence? (*Measure a footprint to find out shoe size; analyze the tread to determine the type of shoe; compare handwriting samples; analyze other fibers.*)
2. What if you were called in to collect evidence from the scene of an art theft? How would you go about collecting evidence? What would you do with your findings? What analyses would you perform on each piece of evidence? What precautions would you need to take to make sure your evidence was authentic?
3. How important is technology to detectives? Can detectives do an effective job using the same tools you used, or must they use more sophisticated tools? Give reasons to support your ideas.

Evaluation:

Use the following three-point rubric to evaluate how well students observe evidence, record their findings, and use the evidence to draw conclusions about who committed a hypothetical crime:

Three points: exhibited strong observation and recording skills; made accurate and detailed observation charts; demonstrated above-average ability to draw conclusions based on the evidence.

Two points: exhibited average observation and recording skills; made accurate observation charts with some level of detail; demonstrated on-grade ability to draw conclusions based on the evidence.

One point: exhibited slightly below-average observation and recording skills; made observation charts with some accurate information but with little detail; demonstrated difficulty drawing conclusions based on the evidence.

Extension:

History of Forensic Science

Have students find out how forensic science has evolved in the United States. They can find answers to the following questions on these Web sites:

<<http://www.mdpc.com/astmhtm.html>>

<<http://library.thinkquest.org/3116/history.htm>>

1. When was forensic science first practiced in the United States?
2. Who were the key players in the history of forensic science?
3. What contribution did each key player make to the advancement of the field?
4. Describe an early case that made use of forensic science. Were investigators able to solve the crime?
5. What safeguards are in place to ensure that forensic science is done properly?
6. Name at least one recent development in the field of forensic science.

After students complete their research, have them develop a visual display on a piece of poster board or on the computer. The display could be a time line, a look at key figures, or a drawing of one aspect of forensics. Give students time in class to share their displays.

Suggested Reading:

High-Tech IDs: From Finger Scans to Voice Patterns

Salvatore Tocci.

Franklin Watts, 2000.

Learn about the science of biometrics—the unique, measurable physical or behavioral characteristics of an individual—and how this new science is changing the world. From security devices to crime detection, biometrics includes things that seem like they belong in a science fiction movie: iris scanning, hand scanning, signature verification, DNA testing, and more. Each chapter explains how these various technologies work and uses actual cases of crimes being solved to illustrate their practical use. The book concludes with a short glossary and endnotes.

Whodunit? Science Solves the Crime

Steven Otfinoski.

W. H. Freeman, 1995.

For an illustration of the different facets of forensic science at work (and if you don't mind a bit of gore), this is a fascinating collection. Each chapter details a particular crime and the detective work that solved it. The cases range from all over the world and span two centuries. It's particularly interesting to see how developments in the scientific world have been applied to crime detection.

Vocabulary:

crime scene

Definition: The place where some form of illegal activity, such as a robbery or a murder, took place.

Context: Police detectives try to collect evidence from a **crime scene** as quickly as possible, before fingerprints vanish or the wind blows fibers away.

evidence

Definition: Something that furnishes proof of a crime and is used in a court of law.

Context: Fingerprints are an important type of **evidence** that detectives look for after a crime has taken place.

fingerprint analysis

Definition: The study of fingerprints, which can take the form of a loop, an arc, a whorl, or a combination of these.

Context: **Fingerprint analysis** is an important part of crime investigations because each person's fingerprints are unique.

forensic science

Definition: The study of evidence discovered at a crime scene and used in a court of law.

Context: The author of the Sherlock Holmes stories, Sir Arthur Conan Doyle, was also responsible for furthering the work of **forensic science** by applying the principles of fingerprinting and firearm identification to criminal investigation work.

Academic Standards:

This lesson adheres to the National Science Education Standards for students in grades 5-8:

1. Physical Science
2. Life Science
3. Science as Inquiry

Credit: Marilyn Fenichel, freelance writer and curriculum developer.

This lesson was created in consultation with Don DeMember, middle school life science teacher.

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