

ASSIGNMENT DISCOVERY ONLINE CURRICULUM

Lesson title:

The Science of Forensics

Grade level:

6-8

Subject area:

Life Science

Duration:

One class period

Objectives:

Students will:

1. Understand the importance of details when gathering evidence in forensic science
2. Understand the relationship of chemistry, physics, and biology to forensic science

Materials:

For each group of students:

- Several pieces of white paper
- Scratch paper
- Two soft pencils
- One roll of clear tape
- One pair of hand lenses

For each student:

- One Classroom Activity Sheet: A Look at Fingerprints
- One Take-Home Activity Sheet: Setting the Scene of a Crime

This lesson plan can be enhanced by purchasing the documentary *Discover Magazine: Forensic Detectives* from our School Store. The documentary airs on the Discovery Channel.

Procedures:

1. Begin the lesson by asking students what they know about forensics. Write their ideas on the chalkboard. Then have a discussion about what forensic scientists do—analyze physical evidence left from a crime or from a medical mystery using the tools of science.
2. Ask students if they know what physical evidence is. Help them understand that fingerprints, hair samples, fibers from fabric, the remains of soil, and blood are all examples of physical evidence. Using the tools of science, trained professionals can analyze these samples to learn more about the person or persons who may have left them behind. Ask students what they think you might learn from each type of physical evidence. For example, by analyzing fingerprints, professionals can identify the type of fingerprint and even match it to a person

who committed a crime in the past and has fingerprints on file. Hair and fiber samples can be looked at under a microscope, revealing the texture of hair or the kind of material. Soil samples can be analyzed to determine whether the person had been nearby or in a different environment before being present at a crime scene.

3. Divide the students into six groups of four or five students. Tell students they are going to learn about one kind of physical evidence that is studied through forensics—fingerprints. Students are going to make their fingerprints, look at them with a hand lens, and then identify the type of fingerprint.
4. Have students follow the steps listed below to make their fingerprints. Each student will make fingerprints of all five fingers of one hand, placing their fingerprints on the Classroom Activity Sheet: A Look at Fingerprints.
 - a. Rub the pencil on the scratch paper until there is a dark smudge of graphite.
 - b. Beginning with the little finger, have each student rub it on the smudge until the fingertip is covered with graphite.
 - c. Then have students place a small piece of tape over their fingertips. Press the tape down gently.
 - d. Students should carefully remove the tape and stick it on a piece of clean white paper.
 - e. Have students repeat the process for the other four fingers of their hands. Have students place the pieces of tape on their Classroom Activity Sheet and label which finger each piece came from. They can use the following abbreviations:
 - T for thumb
 - I for index finger
 - M for middle finger
 - R for ring finger
 - L for little finger
 - f. Have students look at their fingerprints with the hand lens and try to identify what type they have. The Federal Bureau of Investigation categorizes prints by three main patterns—arcs, loops, and whorls. The pictures from the website below show what each type looks like.

http://www.pcsnap.com/reviews.cfm?review_id=fingerbio&rev_page=3
 - g. On their activity sheets, students should record the different types of fingerprints in their group.
5. Have each group report its results to the class, stating how many students had each type of fingerprint. Ask students to keep a class tally and use the results to create a chart or graph on their activity sheets.
6. Discuss the findings with the class: Is one type more common than another type? Is one type relatively rare? If you would like, you can put the fingerprints together to create a catalog of fingerprints from your class.

7. Assign the Take-Home Activity Sheet: Setting the Scene of a Crime for homework. In this activity, students are asked to draw a diagram of their classroom from memory. They should include as many objects as they can remember, along with their correct location and orientation. This activity shows students why forensic teams tape off crime scenes to keep objects from being rearranged or removed.

Adaptation for older students:

Divide the students into teams. Each team should secretly choose one member to be the culprit of a fictional crime. Then have each team construct a crime scene in one corner of the classroom for the rest of the class to investigate. Students can use fingerprints, footprints, handwriting samples, hair samples, and fiber samples as evidence that can be collected and analyzed. By analyzing the physical evidence, other teams can determine who in the group “committed the crime.”

Questions:

1. Based on what you learned during the lesson, identify the different types of evidence investigators look for at a crime scene. How is the evidence gathered and stored? What do investigators do to ensure that the crime scene does not get contaminated?
2. How can a biologist, a chemist, and a physicist help at a crime scene? What skills does each type of scientist bring to forensics?
3. The tool being used most recently by forensic scientists is DNA testing. What are the advantages of DNA testing? Are there any disadvantages?
4. Using the Internet or other resources, find out what tools the Federal Bureau of Investigation (FBI) uses when investigating a crime. How does the FBI synthesize the data it collects and analyze it in order to solve a crime?
5. How do you think detectives solved crimes 100 years ago? What tools did they have available back then? Do you think they were able to solve the majority of crimes? Why or why not?
6. What personality traits do you think a detective needs to have? What skills help make detectives successful at their work?

Evaluation:

Use the following three-point rubric to evaluate students’ work during this lesson. Students should be able to work well in groups, follow the directions to make fingerprints, identify their fingerprints accurately, and record their data accurately.

Three points: students worked together effectively in their groups, followed directions accurately, were able to make all their hand’s fingerprints, were able to identify all the fingerprints in their group, and recorded their data accurately and completely.

Two points: students worked together somewhat effectively in their groups, followed most of the directions accurately, were able to make most of their hand's fingerprints accurately, were able to identify most of the fingerprints in their group accurately, and recorded most of the data accurately and completely.

One point: students had difficulty working together in their groups, followed some of the directions accurately, were able to make some but not all of their hand's fingerprints, were able to identify a few of the fingerprints in their group accurately, and recorded some data.

Extension:

Forensics and History

Forensic scientists are still trying to determine the details behind the assassinations of U.S. presidents Abraham Lincoln and John F. Kennedy. Have your students pick a famous figure and research the circumstances surrounding his or her death. In addition to Lincoln and Kennedy, other examples include Robert Kennedy, John F. Kennedy Jr., and Martin Luther King Jr. Suggest that students focus on what evidence forensic scientists have had available, how they have analyzed the evidence, and what conclusions they have drawn. Students can present their findings as a short report or as a poster display.

Suggested Readings:

The Lincoln Murder Plot

Karen Zeinert, Linnet Books, 1999.

This book closely examines the assassination of Abraham Lincoln, the arrests and trials of the conspirators involved, and the reaction of the American public. Photographs and profiles of all those involved and the use of courtroom testimony, letters, and diaries bring the case to life nearly 150 years later.

Talking Bones; the Science of Forensic Anthropology

Peggy Thomas, Facts on File, 1995.

The author of this book uses actual cases to illustrate how forensic anthropologists study bones to identify a victim and to determine the cause of death. The book also looks at forensic technologies and how they can be used to help archaeologists in their studies of ancient remains.

Web Links:

Abraham Lincoln Online

A wealth of resources related to Abraham Lincoln's life.

<http://showcase.netins.net/web/creative/lincoln.html>

The History Place Presents A. Lincoln

Information about Lincoln's life, including a timeline, photos, and speeches.

<http://www.historyplace.com/lincoln/index.html>

Abraham Lincoln: A Leader of Honor

Includes photos, web links, resources, speeches, and grade-specific lesson plans.

<http://www.abrahamlincoln.cc/>

The Abraham Lincoln Research Page

Contains photos, speeches, lesson plans and classroom activities, related web links, and additional resources.

<http://members.aol.com/RVSNorton/Lincoln2.html>

Abraham Lincoln: A Photobiography

Classroom lessons, combining student activities and use of web resources. Virtual museums on "Causes of the American Civil War" and "Civil War Literature" are also available at this site.

<http://www.sdcoe.k12.ca.us/score/cyberguide.html>

Abraham Lincoln Classroom Lessons and Resources

History-social science lessons by grade level and California State Framework standards.

<http://score.rims.k12.ca.us/gradelevel.html>

Vocabulary:

arc

Definition: A fingerprint that is arched or curved.

Context: Forensic detectives found arc fingerprints at the scene of the crime, leading them to believe that those prints belonged to the suspect they were looking for.

criminology

Definition: The scientific study of crime.

Context: The murder case was transferred to the criminology department of the police force.

forensics

Definition: The application of the tools of science, as well as specific scientific facts, to help solve legal problems.

Context: Sherlock Holmes was an expert in forensics.

loop

Definition: A fingerprint that forms a partly open, curving line.

Context: The investigators at the FBI had a hard time deciding whether the fingerprints were in fact loops.

whorl

Definition: A fingerprint that makes the shape of at least one complete circle.

Context: Solving the crime turned out to be particularly difficult because investigators found both whorl and loop fingerprints, leading them to wonder whether two people were involved.

Academic standards:

Grade level: 6-8

Subject area: Science

Standard: Understands the nature of scientific inquiry.

Benchmark: Knows that there is no fixed procedure called “the scientific method,” that investigations involve systematic observations, collection of relevant evidence, logical reasoning, and some imagination in developing hypotheses and explanations.

Grade level: 6-8

Subject area: Science

Standard: Understands the nature of scientific inquiry.

Benchmark: Knows that scientific inquiry includes evaluating results of scientific investigations, experiments, observations, theoretical and mathematical models, and explanations proposed by other scientists (e.g., reviewing experimental procedures, examining evidence, identifying faulty reasons, identifying statements that go beyond the evidence, suggesting alternative explanations).

Credit:

Marilyn Fenichel, educational writer with more than 15 years’ experience writing curriculum materials for kids; Wendy Goldfein, sixth-grade teacher, Fairfax County School District, Springfield, Virginia, and freelance writer.

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A Look at Fingerprints

Follow your teacher's instructions to create fingerprints from all your fingers on one hand. Place your fingerprints in the five spaces below and label each one (T for thumb, I for index finger, M for middle finger, R for ring finger, L for little finger):

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1. What type of fingerprint do you have - arcs, loops, or whorls?

2. What type of fingerprint does each member of your group have?

a. _____

b. _____

c. _____

d. _____

3. What type of fingerprint is most common in your group?

4. As each group reports their results, keep a tally below.
Then use the results to create a chart or graph on the back.

Setting the Scene of a Crime

During the investigation of a crime, the forensics team needs to know where the different objects in the room were when the crime took place. The exact orientation and placement of objects can be very important to solving a crime. Most crime scenes are blocked off with tape to keep objects from being rearranged or removed. How does this help a forensic team? Try this experiment to see what it's like to recreate a scene from memory.

Tonight: On the back, draw your classroom from memory at home tonight in the space below. Try to remember all the objects in your classroom, exactly where they are located, and how they're oriented.

Tomorrow: Back at school, check your drawing for accuracy and answer these questions:

1. About how many objects did you locate correctly?

2. How many objects in your classroom did you forget altogether?

3. What problems would forensic scientists face if objects were rearranged after the crime and before they had a chance to collect evidence?

4. Why do you think investigators block off crime scenes with tape and not allow any one to tamper with the scene until all the evidence has been gathered?
