**Crime Scene Investigation Labs**

Time: 2-3 hours

Grade: K-12

Number of participants: 12-30

GENERAL GOAL

To introduce participants to a STEM-based career field through experiential learning and interactive materials

SPECIFIC OBJECTIVES

By the conclusion of the activity, participants will:

1. Explore different methods of scientific inquiry related to forensic science;
2. Engage in hands-on experimentation through guided practice;
3. Use evidence to support their interpretation of events;
4. Practice essential skills such as critical thinking, communication, and teamwork

MATERIALS

*Group Notebooks*

* Notepad
* Pencil

*Fingerprint Collection – LAB #1*

* (1) canister of cocoa powder
* (5) makeup brushes
* (5) disposable cookie sheets
* (5) empty beverage bottles (glass or plastic, preferably all the same)
* (5) plastic spoons
* clear packing tape
* unlined white index cards
* disposable nitrile exam gloves
* pen or pencil

*Fingerprint Analysis – LAB #2*

* magnifying glasses
* ink pad or magic marker
* unlined white index cards
* clear packing tape

*Fiber Analysis – LAB #3*

* (1) 2-inch piece of wool yarn
* (1) 2-inch piece of twine
* (1) 2-inch piece of sewing thread
* (1) 2-inch piece of nylon yarn
* (1) cotton ball
* unlined white index card
* clear packing tape
* magnifying glass

*Tool Mark Analysis – LAB #4*

* pliers
* screwdriver
* wrench
* multi-tool
* wire cutters
* (6) lumps of clay

*Handwriting Analysis – LAB #5*

* (6) sheets of white paper or cardstock
* black pens

*Chromatography – LAB #6*

* (1) black magic marker (i.e. Crayola)
* (1) gray magic marker (i.e. Crayola)
* (1) black Sharpie brand marker
* (1) black dry-erase marker
* (1) other black permanent marker (not Sharpie brand)
* solvent - rubbing alcohol, vinegar, or acetone
* (5) 8 oz. plastic cups
* (5) pencils
* paper towels, cut into short strips
* masking tape

PREPARATION

*General*

1. Generate five fictional names to be used throughout the activity.
2. Label each area to be use as a laboratory space or crime scene.
3. Select five staff members who will create documents as “suspects.”
4. Have one of those five staff members also serve as the “perpetrator.”
5. Assign each person a marker, tool, fiber, and fictional name.
6. Work together to prepare each lab as described below.

*Fingerprint Collection – LAB #1*

1. If possible, remove the labels and glue from the bottles. This will give you an optimal surface for creating your prints.
2. Rinse and dry the entire surface of the bottle with a dry paper towel to remove any contaminating evidence.
3. Be sure that ONLY the person who is designated as the “perpetrator” makes the fingerprints on the bottles. If your hands are dry, or you are not leaving visible prints, gently rub your fingertips on your forehead or scalp. Using your thumb and index finger, place several prints on different areas of the bottles. **(You will need to repeat steps 2 and 3 for each group visiting LAB #1 throughout the activity.)**
4. Lay out the unlined index cards so they are accessible to everyone performing the lab test.
5. Set up one tray per person containing a spoon, brush, and a bottle.
6. Cut 3-5 pieces of clear packing tape for each station.
7. Lay out a pair of nitrile gloves at each station.

*Fingerprint Analysis – LAB #2*

1. Wash your hands thoroughly.
2. Using the inkpad or magic marker, cover your pad of your thumb and index finger with ink.
3. For each finger, press down on the index card and roll your finger pad from left to right once. The full print is visible on the card. If the print is not clear, wash your hands and try again.
4. Cover the prints with clear packing tape to secure them and prevent smudging.
5. Make sure each staff person labels their samples with their assigned fictional name.
6. Place the fingerprint samples in LAB #2.

*Fiber Analysis – LAB #3*

1. Pull apart the fibers of the yarn, thread, cotton ball, and twine so that you have only a few fibers of each.
2. Using one piece of clear packing tape, tape each fiber to an index card.
3. Make sure each “suspect” labels their fiber with their fictional names.
4. Create an additional sample from the fiber assigned to the “perpetrator” and label it “EVIDENCE.”
5. Place all of the samples, including the EVIDENCE sample, face down in LAB #3.

*Tool Mark Analysis – LAB #4*

1. Using the tool assigned to the “perpetrator,” create unique marks in a ball of clay.
2. Wash the tool and make sure that any clay or residue is completely removed.
3. Allow the clay cast to dry.
4. Place the other five balls of clay, as well as the tools, in LAB #4.

*Handwriting Analysis – LAB #5*

1. On the sheet of paper or cardstock, each “suspect” writes the uppercase and lowercase letters of the alphabet. (i.e. Aa, Bb, Cc, etc.)
2. The “perpetrator” then writes a ransom note for the stolen object.
3. Place all writing samples, including the ransom note, in LAB #5.

*Chromatography – LAB #6*

1. Cut the paper towels into strips ½-inch shorter than the height of the plastic cups. You will need enough strips for each group to perform five tests.
2. Tape one strip of paper towel to one of the pencils.
3. Pour ½-inch of solvent into each cup. The paper towel should barely touch the liquid when the pencil is balanced on the rim of the cup.
4. Using the “perpetrator” marker, draw a horizontal line near the bottom of the paper towel strip—not so low that it would be submerged, but low enough that any absorbed solvent can reach it.
5. Rest the pencil on the rim of the cup, and allow the strip to absorb the solvent.
6. Once the solvent is absorbed about half way up the paper towel strip, remove it from the cup, detach it from the pencil, and let it dry. Tape it to an index card and label it “EVIDENCE.”
7. Place the cups and supplies in LAB #6.

*Crime Scene Walk*

This is the most creative part of the preparation process. You will need to come up with a basic crime story that has been committed at your program. You can decide the severity of the crime, but you will need to include elements that can be used in each lab. For our purposes, we used theft of a classroom computer. We also used crime scene tape and evidence number markers for added effect. In our arts and media classroom, we staged the crime using the following narrative:

* The perpetrator broke open the window using some kind of tool. (LAB #4)
* They tore their clothes as they climbed inside. (LAB #3)
* They began searching the room and ransacked the supplies cabinets and storage bins.
* Then they knocked over several chairs to reach under the table and unplug one of the computers.
* In the struggle to carry the computer, they left behind an empty drink bottle. (LAB #1, LAB #2)
* On their way back out the window, they knocked over a shelf, spilling its contents on the ground.
* Later, they returned and left a note for the first person arriving the next morning. (LAB #5, LAB #6)

CRIME LAB INSTRUCTIONS

*Fingerprint Collection – LAB #1*

In this lab, your goal is to collect evidence by lifting fingerprints left at the crime scene. The evidence you collect will be analyzed in the next lab.

1. Put on a pair of nitrile gloves.
2. Sprinkle some cocoa powder on the surface of the empty bottle.
3. Using the makeup brush, very gently dust off the excess powder to expose the print. Be careful not to swipe too many times or brush too vigorously, or you will end up brushing away the evidence!
4. Holding one edge of the tape, press the other edge of the tape over the fingerprint, completely covering it.
5. Peel the tape off of the bottle and stick it to an index card. Write the word “EVIDENCE” on the card.
6. Repeat Steps 2-5 until the group has at least 2 EVIDENCE cards per person.

*Fingerprint Analysis – LAB #2*

Fingerprints are a lot like snowflakes; no two are ever the same. Using your observation skills, try to determine who left their prints at the scene of the crime.

1. Examine the fingerprint sample cards of each suspect.
2. Use the magnifying glass to get a closer look at the patterns. What patterns or shapes do you see? How can you tell if the fingerprints are different?
3. Take your time and compare your EVIDENCE cards with the different suspect samples.
4. Discuss your findings with your group. Decide together which suspect’s fingerprints match the evidence you collected. Draw a picture of the matching print in your notebook and label it with your suspect’s name.

*Fiber Analysis – LAB #3*

Clothing is made from many different kinds of materials. Based on the properties you identify, try to see whose shirt might match the one ripped at the crime scene.

1. Take a look at the EVIDENCE card. What do you see?
2. List the color, length (long or short), and texture (smooth, rough, curly, straight) of the fibers in your notebook. What do you think it’s made out of?
3. Using the magnifying glass, compare the EVIDENCE card to the suspect samples.
4. Discuss your findings with your group. Decide together which suspect sample matches the EVIDENCE card. Record the name in your group notebook, and your reasons for choosing that suspect.

*Tool Mark Analysis – LAB #4*

In this lab, your goal is to figure out which tools could make the strange marks left behind. Through experimentation, you will try to identify the tool used during the crime.

1. Examine the cast of the tool marks found at the scene. Have you ever seen these marks before?
2. Take a look at the tools on the table. Can you tell already which tools might have made the mark?
3. Test each tool by making marks in the clay with it. Try it from different angles.
4. Check your tool marks against the evidence cast. Do any of them match?
5. Discuss your findings with your group. Decide together which tool you think caused the marks on the window during the break in.
6. Record the tool, and the name of its owner, in your group’s notebook.
7. Draw a sketch of the tool so you remember, and use an arrow to indicate which part of the tool caused the marks.

*Handwriting Analysis – LAB #5*

A person’s handwriting is almost as unique as their fingerprints. Analyze the unique features of the handwriting in the note, and see if you can match it to any of our suspects.

1. Carefully examine the note left at the scene. What do you notice about the handwriting? Is there anything that stands out to you?
2. Compare the note with the suspects’ handwriting samples. See if you can match a sample with any of the things you’ve noticed.
3. Discuss your findings with your group. Decide together who you think wrote the note.
4. Record the name of your suspect in your group’s notebook. Also include the details that led you to your conclusion.

*Chromatography – LAB #6*

Even though the ink is the same color, different brands of ink have different chemical compositions. In this lab, you will perform a chemical analysis of the different inks to see which one was used to write the note.

**Do NOT drink the liquid in the cups.**

1. With the first marker, make a line about ¼ of the way up the test strip.
2. Tape the opposite end to the middle of the pencil so the strip hangs down when the pencil is horizontal.
3. Place the test strip in the solvent cup, and rest the pencil on the rim.
4. Repeat Steps 1-3 for each marker, using a different cup each time.
5. Let the test strip absorb the solvent. Discuss your observations with your group.
6. After the test strip is finished absorbing, compare the results with the EVIDENCE card.
7. Discuss your findings as a group Decide together which marker was used to write the note.
8. Record the brand and color of the marker, along with the name of its owner, in your group’s notebook.

*Crime Scene Walk*

Every crime scene is processed by doing a “crime scene walk.” It allows police officers and detectives to determine the “sequence of events.” With your group, try to figure out the order in which the events occurred during the crime. Be careful not to disturb anything! It might be evidence!

1. Make observations:
   1. What items are out of place?
   2. Where did the person come in?
   3. What’s missing?
   4. What doesn’t belong?
   5. Is there any other evidence you can identify?
2. Try to make sense of what you see. Can you figure out the exact steps the person took when they entered the room? What did they do first? How did they leave?
3. Discuss your observations and findings with your group, and provide details to support your ideas.
4. Working together, record your group’s story of what happened in the room from start to finish. Again, use details to support your ideas.

NOTES FOR THE INSTRUCTOR

* Assign a staff member to each a lab, giving them the instructions for their station. Make sure they understand how the station is supposed to run.
* Divide the participants into no more than 6 groups and assign them a number 1-6.
* Each group will start at the lab that corresponds to their group number, except Group 2. Group 2 will start with the Crime Scene Walk.
* Inform the groups that they are forensic scientists recruited to help solve a crime committed in the building last night. The list of suspects has been narrowed down to five people, and you need their help to figure out “whodunit.” Their job as scientists is to perform experiments, make observations, record information, and identify which of the five suspects committed the crime.
* Provide an overview of how the activity will run, as well as a brief description of each lab.
* Every 15 minutes rotate the labs, in order from 1-6, until each group has visited each of the seven stations (Labs 1-6, Crime Scene).
  + On the first rotation: Group 1 moves to Lab #2, Group 2 moves to Lab #3, Group 3 moves to Lab #4, Group 4 moves to Lab #5, Group 5 moves to Lab #6, and Group 6 moves to the Crime Scene. After the first rotation, rotate the groups through the labs in order. This ensures that each group will participate in each lab.

1🡪2🡪3🡪4🡪5🡪6🡪Crime Scene🡪1

WRAP UP

Once each group has had the opportunity to visit each lab and the crime scene, give them a few minutes to secure their evidence, record any last details or findings in their notebooks, and wrap up any discussions with their group. Invite each group to share their account of what happened and to identify their prime suspect. After each group’s presentation of the facts, allow other participants to ask them questions about the process, the evidence they’ve collected, and their observations. When each group is finished presenting their facts, discuss the activities and the exploration process as a large group using open-ended questions.

* Why is it important to perform different lab tests?
* What challenges did your group experience?
* How did you work out any disagreements?
* Which lab was most difficult? Why?
* Which lab was easiest? Why?

Finally, reveal the fictional name of the “perpetrator.”

If you are working with an older group, you can also include information about careers in forensic science and criminal justice, including educational requirements, job outlook, training, skills, technology, and other areas that may be of interest to the group.

