

Chapter One

Stop, Look, and Listen

Using the Five Senses in Forensic Science

The power of observation, using the senses to gather information, is a detective's most important tool. Observation is a fundamental skill and the basis for every thorough investigation in both forensics and science. Through systematic observation and documentation, detectives and scientists identify problems, collect evidence, and develop theories. In this chapter, students are encouraged to use their natural curiosity to learn how to become careful, methodical observers. The ability to observe depends on the five senses. These senses have natural limitations, and students find out how simple instruments and techniques can give them an edge in scientific thinking.

Activity 1.1: Trained Eyes

Teacher Briefing

In this activity, students begin to develop skills of systematic observation by looking closely at a familiar place. The activity allows you to choose between using your own classroom or exchanging classrooms for the day with another teacher so that the setting will be familiar to students but not exactly what they are used to. If you do exchange classrooms, make sure that you and the other teacher tell students to take any valuable items with them. Also be sure to let the principal and support staff know about your plan.

Activity Preparation

- Optional preparation: Gather this optional equipment:
Magnifying glass
Tweezers
Envelopes to collect evidence
- Make arrangements to switch classrooms if you choose that option.
- If you have decided to use your own classroom, determine how you will divide it up into search areas and plan ahead what items you will change in each area at the end of the exercise. For example, you might add a new picture to the bulletin board, turn a desk at an angle, or erase something on the chalkboard.
- Make copies of Science Sleuth Activity Package.

First, Tell Your Students . . .

When detectives arrive at a crime scene, they quickly put their skills of observation to work. Observation is the first step in every investigation because the place where a crime occurred has a story to tell.

Smart detectives look at everything. That's why they often see things that others overlook. Here's a classic case in which keen observation solved a case. It happened almost a century ago, in 1910.

A midnight burglar broke into the home of Clarence Hiller, his wife, and four daughters. The perpetrator woke the family, scuffled with Mr. Hiller, and then escaped. The police were called, and detectives were quickly dispatched to the Hiller home. In spite of a thorough search, they turned up little evidence. However, one sharp-eyed detective noticed that the paint on the porch railing was still wet and found out from Mr. Hiller that he had painted it on the afternoon of the break-in.

A thorough check of all the railings revealed that the intruder had left four clear fingerprints in the fresh paint. Back then, fingerprints were not always collected for

evidence as they are today. But the detectives collected them anyway, just in case they might be useful.

By coincidence, police in another part of town had arrested a man that same evening. Thomas Jennings was found wandering around a neighborhood, acting confused and lost. His clothes were torn and dirty, so officers suspected that he had been up to no good. Officers had Mr. Jennings sitting in the local jail by the time the detectives finished their investigation of the Hiller home. Jennings's fingerprints were compared to those from the porch railing and found to be a perfect match.

Good eyes—the kind that spot little pieces of evidence—are as essential in solving crimes today as they were in 1910. All detectives need good observation skills. Start training your eyes to see it all.

Activity Procedure

1. Distribute the Science Sleuth Activity Package, magnifying glasses, tweezers, and envelopes.
2. If you are switching classrooms, do this now.
3. Divide your students into groups, and give each group an area to search. For example, one group might search the chalkboards and displays, while others search in cabinets and bookcases. You can divide the student desks into different sections for searching. If you are using your own classroom, make sure that students search an area where they don't usually sit.
4. Tell students to follow the directions in the Science Sleuth Activity Package. Let them know that they'll be asked some questions later, so they need to observe carefully.
5. Give students a fixed amount of time, about ten minutes, to do their search.
6. If you are using your own classroom, have students stand in the back of the room and close their eyes while you make your planned changes in the room's environment.

Summary and Discussion

- If you use another teacher's classroom, ask students:
How is it different from their own classroom?
What is the other class studying?
How many boys and how many girls are in the class? (The groups will need to collaborate on this answer.)
Was anyone in the classroom eating recently?
- If you use your own classroom, ask students what they noticed about the classroom that was new to them.
- Systematic strategies help make searches more successful. Ask the students if they have any ideas about such strategies.

Science Sleuth Activity Package: Trained Eyes

Background

When detectives arrive at a crime scene, they quickly put their skills of observation to work. Observation is the first step in every investigation because the place where a crime occurred has a story to tell. In a way, the crime scene is like a jigsaw puzzle that hasn't been put together. Pieces of the puzzle are lying around, right in front of your eyes. Some are stuck under other pieces, and some are turned upside down. With a little patience, you will be able to put each piece together to make a picture that can help solve the crime.

Wise detectives look at everything. That's why they often see things that others overlook. Observant eyes—the kind that spot little pieces of evidence—are essential in solving crimes. Like all other skills, you can develop your powers of observation by practice. In this investigation, you'll get a shot at observing with detective eyes.

Activity Directions

1. Join your group in the area that the teacher has assigned you to search. You may want to discuss with your group how to conduct the search, dividing up the space or the tasks.
2. Look at the area as a whole. Make notes or draw a picture of the main things that are in the area.

3. Now take a closer look. What was happening here most recently? Was a class working on a project? Was someone reading? Has anyone been eating? How can you tell?

4. What does this room say about the people who spend time here? Is there sports equipment in sight? A novel? A CD?

5. Now, get on your hands and knees and look closely at the floor. Peek under and behind the furniture. What has gotten lost back there? Are there any hairs or threads? What could they tell you?

6. Join your group, and review your findings as you prepare to answer the questions your teacher will ask.

Activity 1.2: Up Close and Personal

Teacher Briefing

This is an extension of the previous activity, with students learning to observe things about their personal clothing and their possessions. Students are paired to work with a partner. Depending on the age and maturity of your students, you will need to consider whether the pairs should be same-sex or not and what limits you should set on the search.

Activity Preparation

- Decide how you will pair students.
- Consider any limitations you want to put on the search.
- For each student, provide:
 - Magnifying glass
 - Tweezers
 - Envelopes to collect evidence
 - Plastic bag or newspapers
- Make copies of the Science Sleuth Activity Package.

First, Tell Your Students . . .

When detectives check out a scene, they *really* check it out. To find tiny clues, they get up close and personal with a magnifying glass.

One of the best places to discover clues with a magnifying glass is on clothing. Hairs, threads, and tiny specks of dirt will cling to clothes. These tiny messengers give a detective hints about where those clothes have been.

Some of the most important evidence in a case may not be out in plain view—it could be in a bag or a purse. The more that detectives can explore a crime scene, the more they can learn about what happened. A personal possession like a backpack, purse, suitcase, or wallet often holds clues that tell a detective something about its owner and that person's habits.

Activity Procedure

1. Distribute the Science Sleuth Activity Packages, magnifying glasses, tweezers, and envelopes.
2. Following your plan, assign the students to their partners.
3. Tell the students to inspect their clothes and shoes for possible evidence, following the guidelines in their Science Sleuth Activity Package. Depending on the age and maturity of your students, you may want them to inspect themselves rather than their partner.

4. Tell students that they are going to search each other's backpacks or purses. Give them a few minutes to place any personal items in their desk. You may also want them to place their wallet or any money or valuable items in the desk.
5. Now tell students to search each other's belongings, following the guidelines in their Science Sleuth Activity Package.

Summary and Discussion

- Ask students if they found anything surprising in their search of their own clothes and shoes. Were they able to identify the source of any threads or hairs on their clothes? How about stains on their shoes?
- Ask students what they found in their partner's backpack. Can they tell what their partner likes to eat? to read? to listen to? Were there any materials with dates showing where their partner had been or is planning to go?
- Ask students to imagine they are assigned a case involving a missing person. Where is the first place they would search for evidence? What kinds of things would they hope to find?
- Ask students to imagine that they searched a woman's purse and found three receipts issued on the same date. One receipt was for the purchase of gasoline in one town at 9:00 A.M., another receipt for lunch in a town two hundred miles to the north, and a third for a hotel located another two hundred miles down the road. What could they conclude about her activities? Student answers will vary but might suggest that the woman has traveled four hundred miles by car on this date and that she stopped for only one meal.
- During the 1997 robbery of a convenience store in Conroe, Texas, would-be thieves Michael and Lisa Morrison held up the store and then ran out with their pockets full of cash. They would have made a clean getaway except for one mistake: Mrs. Morrison left her purse at the store. What kind of useful information might the detectives find in her purse?

Science Sleuth Activity Package: Up Close and Personal

Background

When detectives check out a scene, they *really* check it out. To find tiny clues, they get up close and personal with a magnifying glass.

One of the best places to discover clues with a magnifying glass is on clothing. Hairs, threads, and tiny specks of dirt cling to clothes. These tiny messengers give a detective hints about where those clothes have been. Use your magnifying glass to check out the clothes that you're wearing. See what they reveal about your activities today.

Some of the most important evidence in a case may not be out in plain view; it could be in a bag or purse, for example. The more detectives explore a crime scene, the more they learn about what happened there. A personal possession like a backpack, purse, suitcase, or wallet often holds clues that tell a detective something about its owner and that person's habits.

Activity Directions

1. Start at your feet and inspect your shoes. Look at the tops of them first, and then check out the soles. Do you see any soil? How about bits of plants? Where could they have come from? Use this space to make notes about what you see.

2. Inspect your clothing inch by inch. Look in the hems, cuffs, and pockets. Do you find any threads, hairs, or stains that might tell something about where you've been or what you've done? Make notes on what you find.

3. Review the list of things you found on your person. Can you explain where each clue came from?

Science Sleuth Activity Package: Up Close and Personal, *Cont'd.*

4. Using the plastic bag or newspapers your teacher provided, spread out the contents of your partner's backpack. Make a list of the things you find.

5. Do you see any schoolwork? Does it tell you what classes your partner is taking?

6. Is there a calendar or notepad in the book bag where your partner writes down assignments and dates? Does it tell you where your partner has been or is going?

7. Is there any food in the bag?

8. Are there any clues in the bag to what your partner does for fun? Books? CDs?

Activity 1.3: Quick Draw

Teacher Briefing

This activity extends the observation skills students have been learning. Students are asked to visualize an imaginary crime scene, translate the verbal data they receive into a sketch, and draw conclusions about what happened based on what they see in their sketch.

Activity Preparation

- Provide students with art materials such as markers, colored pencils, and special paper.
- Make copies of the Science Sleuth Activity Package. Add a blank page to it where students can make their drawing.

First, Tell Your Students . . .

Crime scene sketches are important pieces of evidence in solving cases. A sketch helps investigators visualize items at the crime scene in proper perspective. Long after the crime scene is closed or released, an investigator can still see exactly where each item was located with respect to other items at the scene. Good crime scene sketches may provide valuable information and clues that help solve cases.

Some crime scene sketches make their way into the courtroom. During a trial, a witness may use a crime scene sketch to indicate his or her location during the crime. A sketch can also help members of the jury understand the layout of a room or building.

Activity Procedure

1. Distribute the Science Sleuth Activity Package and any special art materials you want your students to use.
2. Tell students to make a sketch of the crime scene. Remind them that they don't have to draw everything as an artist would. They can use squares, circles, and triangles to represent furniture and X's or other letters to represent items.
3. Give students plenty of time, twenty to thirty minutes, to draw the crime scene.

Summary and Discussion

- Ask students:
 - “From your research, how do you think a thief could have entered and left the classroom?”
 - “How could a person get a python out of the classroom without being detected?”
 - “From your drawing, is it likely that Pearl the Python broke open her terrarium and escaped alone? Why or why not?”

Science Sleuth Activity Package: Quick Draw

Background

You've heard the old saying, "A picture is worth a thousand words." That's definitely true in crime scene work. Notes are essential, but they don't always convey the "how" of the story. That's when a sketch comes in handy.

Crime scene sketches don't have to be works of art. Lots of detectives draw stick figures for people and squares or circles to represent furniture, buildings, cars, and so forth. The main purpose of the sketch is to show where important items are located.

You have been called to a crime scene at the local middle school at 7:30 A.M. on Monday. The students haven't arrived yet, but Mr. Bones, the science teacher, has been at school long enough to discover a theft: his beloved classroom pet, Pearl the Python, has been stolen. The Crime Scenario at the end of this package tells you what you see when you arrive.

Activity Directions

1. Read the Crime Scenario carefully.
2. Based on the description, use the blank page attached to your Science Sleuth Activity Package to sketch the crime scene.
3. Remember that this doesn't have to be a work of art. Here are some ideas:
 - Start by drawing the outside wall of the classroom.
 - Show where the doors are.
 - Add the furniture. You can use rectangles or circles or any other kind of symbol to represent the furniture.
4. Your drawing should show the following: the teacher's desk, students' desks, the blackboard, bulletin boards, TV, table, broken glass, hammer, window, classroom door, and closet door. Label each of these items.

Questions for Discussion

- How do you think a thief could have entered and left the classroom?
- How could a person get a python out of the classroom without being detected?
- From your drawing, is it likely that Pearl the Python broke open her terrarium and escaped alone? Why or why not?

Science Sleuth Activity Package: Quick Draw, *Cont'd.*

Crime Scenario

From where you stand at the classroom door, the room appears to be a large square. The door is on one end of the front wall of the classroom, and it leads from the classroom into the hallway. As you take a step into the room, you see a blackboard and a TV mounted on the wall to your immediate left. In front of the board is a teacher's desk and chair. Facing the teacher's desk are thirty student desks arranged in six rows. All desks are empty except for two: the last desk in the second row from the door has a jacket on it, and the first desk in the first row has a backpack in the seat.

From your position, you're facing the only window in the room. It's located on the far wall directly in front of you. Two bulletin boards decorate the rest of this wall to the left of the window. Under the window is a table that holds the remnants of a large, broken terrarium. Glass shards are scattered all over the table. A hammer is lying on the floor under the table. You can also see another door that opens on the wall to your right. It looks like a closet door. A countertop with a sink runs the length of the wall to your left.

Activity 1.4: Get the Picture?

Teacher Briefing

This activity offers two ways for students to make a record of the crime scene. In one, they take photographs; in the other, they make a scale drawing. You may prefer to use one strategy or the other depending on the resources available at your school. Or if you are able to keep the crime scenes set up for a few days, you could do the photography and the scale drawing in separate classes.

Activity Preparation

- Set up two or more crime scenes in your class, depending on how many groups of students will be working on this project. You will want to protect the crime scenes, if possible with the yellow tape real detectives use. With this or some other kind of tape, mark the limits of the crime scenes. Here are some examples of crime scenes:

Example 1: Draw the chalk line of a body on the floor. Beside the “body,” drop a rag stained red. Bring in dirty shoes, and make footprints leading to and from the “body.” Leave an open wallet to the side of the “body.”

Example 2: Stand a shoe box on a table with the cover atilt. Have some play money strewn on the table to suggest a robbery. Drop an ID card nearby. Rub some graphite on your finger, and make one fingerprint inside the box lid.

Example 3: Bring in a stroller with an empty blanket in the seat, and tack a ransom note on the top. Drop some cracker crumbs on the floor next to it, and step on the crumbs to leave a print.

- Make copies of the Science Sleuth Activity Package. Add a blank page to it where students can make their drawing.
- For each student or student group, provide:
 - A camera (digital if possible)
 - Sticky notes (3 inch by 3 inch)
 - Graph paper (4 squares to an inch)
 - Compass
 - Measuring tape
 - Ruler

First, Tell Your Students . . .

Even the best detective in the world cannot remember every detail about a crime scene. That is why it is important to make a record of it. There are a couple of ways to do this, and we are going to practice two: taking photographs and making a scale drawing.

First, detectives walk around the crime scene, making sure that they don’t disturb any evidence with their hands or feet. A walk-through helps them get a perspective

on the entire crime scene. Then they put flags or labels near the pieces of evidence, taking care not to disturb anything. The next step is to prepare a scale drawing or take photographs, or both.

Activity Procedure

1. As students enter the room, point out the crime scenes and warn them that they must not contaminate the evidence.
2. After you've read the introductory material, assign students to teams and distribute the Science Sleuth Activity Package and the tools you are providing.
3. Tell students to decide among themselves which students will have the following assignments:
 - Label and list possible evidence.
 - Take photographs of the scene.
 - Make a log of the photographs.
 - Draw a quick sketch of the crime scene.
 - Take measurements and make notes of these for the scale drawing.
 - Make the scale drawing.

Depending on how many students are in each group, a student may have more than one assignment.
4. Tell students to conduct the investigation following the directions on the Science Sleuth Activity Package.

Summary and Discussion

- Ask each student group to tell how many photographs they took of the scene. Did they discover any new evidence when studying the photographs or scale drawings? If so, what is it?
- Based on what they see at the crime scene, what do they think happened? What might their next steps be if they were investigating the crime?
- Why do detectives take a lot of pictures? Why do they make a log of the photographs they take? Answers will vary, but students should explain that pictures help preserve the crime scene. A log provides information about each picture and explains when, and from what angle, each picture was made.
- Why do detectives make scale drawings of crime scenes? Scale drawings show the exact locations and relative sizes of items at a crime scene.
- Which drawing would be larger: one drawn to a scale of one inch equals one foot, or one drawn so that one-quarter inch equals one foot?
- If the crime scene was a two-mile stretch of highway, what kind of scale might you use? (Remember that one mile equals 5,280 feet.) Answers will vary but might include one inch equals one hundred feet.

Science Sleuth Activity Package: Get the Picture?

Background

Detectives know that it's important not to disturb the crime scene by touching evidence or walking nearby. It's also important to make a record of the crime scene, and there are a couple of ways to do this. We are going to practice two: taking photographs and making a scale drawing.

First, detectives place flags or labels near pieces of evidence to help identify them later.

The photographer takes pictures from three perspectives: overview, midrange, and close up. If the crime scene is too big to fit in one shot, overview pictures can be taken in an overlapping sequence that begins in one place and moves clockwise around the scene. In the progressive technique, the photographer begins at the outside of the crime scene and takes pictures moving toward the center.

Detectives must keep a log of all the photographs they take. Later, the log will describe what angle the photograph was taken from and what piece of evidence it shows. To give an idea of size, a ruler can be carefully placed next to the item of evidence.

Without a scale, it might be hard to tell if an object is one inch or one foot long. This brings us to a second way of recording the crime scene: a scale drawing.

The easiest measuring technique is the rectangular method. Detectives make measurements at right angles (90 degrees) to flat surfaces, like walls. They measure objects in the crime scene, distances between them, and distances to the edge of the crime scene. Two measurements must be made of every object. After taking multiple measurements and making quick sketches, detectives return to their offices to make detailed, accurate drawings.

Your Science Sleuth Activity Package has an example of a scale drawing of a crime scene. The scale drawing is broken down into four parts: the title, north arrow, body, and legend. The title, at the bottom right-hand corner, identifies the crime scene. The north arrow indicates which way is north. Usually the arrow points up, and the drawing is positioned to reflect this.

The body of the drawing is the biggest area and is the region where the drawing is made. The legend is used to identify objects, like a sofa, which may be labeled as A and a chair as B, as in the "Scale Drawing of Crime Scene" at the end of the activity package. If there is evidence that the suspect walked through the crime scene, a dotted line is drawn from point of entry to exit.

Activity Directions

1. With your team of detectives, walk around the crime scene, and look at it from different angles.
2. Decide what the key pieces of evidence are. Use sticky notes to label each piece of evidence with a number. Take care not to touch any evidence. (If you are part of the scale drawing team, skip to item 10.)
3. If you are the photographer, take a picture of the entire crime to serve as an overview. If possible, get the overview from several angles.

Science Sleuth Activity Package: Get the Picture?, *Cont'd.*

4. While you are taking photographs, make sure that you or one of your partners keeps a log describing each photograph.
5. Decide which items need to be photographed at midrange or close up. Place a ruler beside items to give them perspective. Use different angles so you will get all of the features of the evidence.
6. Document everything in your log.
7. If you have taken digital photographs, print them out, arrange them in the order in which they were taken, and check them against the log.
8. Examine the photos carefully with a magnifying glass. Do you see anything that you missed the first time you reviewed these pictures? Does the hand lens reveal any footprints or tracks? A tiny necklace? A scrap of paper? Make notes.
9. Answer these questions:

How many photographs did you take to get a complete picture of the crime scene?

Why do detectives take a lot of pictures at a crime scene?

Why do detectives make a log of the photographs they take?

Did you discover any new evidence when studying the photographs? If so, what is it?

If you are part of the photography team, stop here.

Science Sleuth Activity Package: Get the Picture?, *Cont'd.*

10. Make a rough sketch of the crime scene on the blank piece of paper at the end of the activity package. Be sure to include each piece of evidence in your rough sketch.
11. Use the compass to find out which direction is north. Indicate north with an arrow on the sketch.
12. In the bottom right-hand corner, give the sketch a title.
13. Reserve an area along one side of the paper where you can draw the legend.
14. Select two spots to serve as your reference points. These could include a piece of evidence or the edge of the crime scene.
15. Working with a partner, measure each piece of evidence from both reference points. Label the distance from each reference point to the evidence.
16. Measure the size of each piece of evidence—both its height and width.
17. Use the graph paper attached to your activity package to make a final scale drawing. Let one inch represent one foot at the crime scene.
18. Neatly transfer all your sketches and drawings to the graph paper.

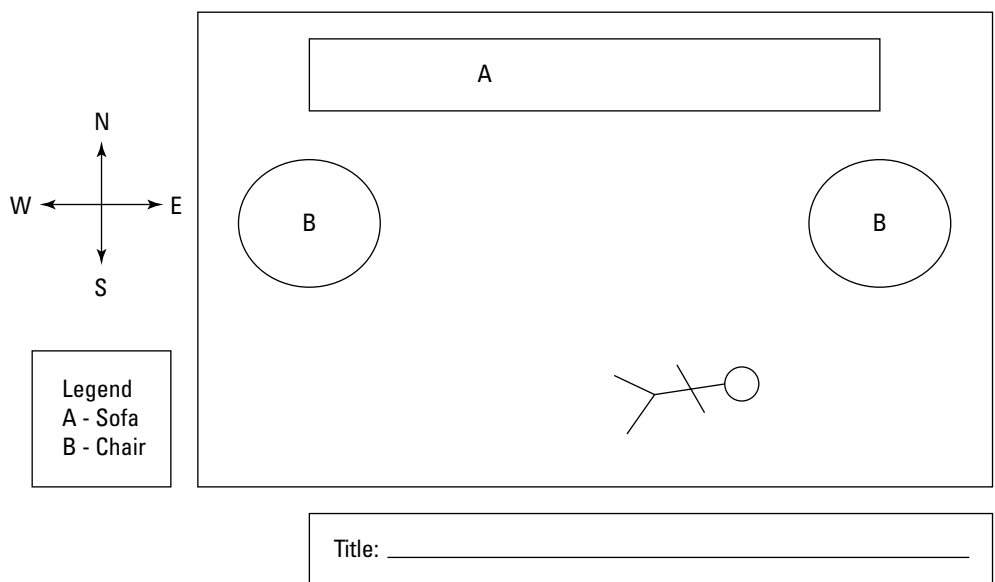
Questions to Answer

- Why do detectives make scale drawings of crime scenes?

- Which drawing would be larger: one drawn to a scale of one inch equals one foot, or one drawn so that one-quarter inch equals one foot? Explain your answer.

- If the crime scene was a two-mile stretch of highway, what kind of scale might you use? (Remember: one mile equals 5,280 feet.) Explain your answer.

Science Sleuth Activity Package: Get the Picture?, *Cont'd.*



Scale Drawing of Crime Scene

Activity 1.5: Sniffing Out the Solution

Teacher Briefing

In this activity, students conduct an experiment and collect data on odors. In the process, they learn how different kinds of questions require different kinds of scientific investigations. They also learn how evidence supports logical conclusions.

Doing this activity in small groups allows students to draw conclusions for themselves and also collaborate on answers.

Activity Preparation

- For each student group, collect six small containers—film canisters with tops or small margarine cups are ideal.
- Put a blank piece of masking tape on each container, and label them A, B, C, D, E, and F.
- Put a cotton ball inside each container, and close it.
- Select two liquids with distinctive odors, such as coffee and a household cleaner. (Take care when selecting a household cleaner. Some cleaners may irritate the eyes and nose.)
- Select two fruit juices with similar odors (orange juice and lemon juice work well).
- Select two solids with distinctive odors (such as peppermint candy, oregano or rosemary, or soap).
- Shortly before class begins, open all the containers. Put one of the substances in all the A containers, another substance in all the B containers, and so on. Keep track of which substance is in which container:

Container

Substance

A

B

C

D

E

F

- Sort the containers into sets, so that each group will have a full set of containers A to F.
- Make copies of the Science Sleuth Activity Package.

First, Tell Your Students . . .

You've undoubtedly heard of the five senses: seeing, hearing, smelling, touching, and tasting. People are equipped with special organs for each sense. Your eyes are special organs for seeing. Ears make it possible to hear, the nose enables us to smell, the skin is responsible for the sense of touch, and the tongue's taste buds give materials distinctive flavors. When police detectives arrive at a crime scene, their senses are primed and ready for action. Savvy detectives use all of their senses to help analyze clues. Odors may tell an investigator something about who has been at the scene or what has recently happened there.

A person has a pretty good sense of smell, but a dog's ability to detect odors is phenomenal. A dog's nose is forty-four times better at picking up odors than a human's nose. Dogs are super-sniffers because their bodies are especially designed to find odors. That's why the police have come to rely on them so heavily as K-9 partners.

Odors are made up of invisible particles that float in the air. The inside of a dog's nose is loaded with special cells that pick up these odor particles. When weather conditions are right, dogs can detect odors up to one-half mile away. In addition, dogs have plenty of brainpower for processing the odors they detect. A lot more space is dedicated to odor interpretation in a dog's brain than in a human's.

Sniff lineups have proven dogs' abilities to smell out objects. Canines can tell the odor of one person from another, even in a large group. They can also find an individual after smelling a sample of that person's clothing. That's why they are great at finding lost children or tracking prisoners who have escaped. Dogs are such good smellers that they can be trained to hone in on scents of special interest, like drugs or explosives. At an airport, dogs are often used to check boarding passengers and their luggage. Drug-sniffing dogs can also check a line of cars faster than their human counterparts can.

Although all of the senses are helpful, this activity concentrates on the sense of smell. You will have an opportunity to find out what the nose knows.

Activity Procedure

1. Distribute the Science Sleuth Activity Packages and smell containers, and assign students to groups.
2. Demonstrate for students the most effective way to smell: pass the container back and forth under your nose, at least two or three inches from your face.
3. Tell students to follow the instructions on the Science Sleuth Activity Packages. They should attempt to identify the odors individually, then compare notes and come up with a group answer also.
4. Give students about thirty minutes to complete the activity.
5. Reveal the answers. If possible, show students the bottle of liquid or the object that created the smell. Let them compare the smell in their container to the smell of the original object if you choose to do so.

6. After everyone has had an opportunity to check their answers against the correct list, gather the class for discussion.

Summary and Discussion

- How many students identified all of the odors correctly? Were the group's collaborative answers better than the individual's?
- Which odors were the hardest to identify?
- Odors can be associated with memories. What odor in your life brings back a memory? For example, do baking cookies make you think of the holidays? Does the smell of tomato sauce and cheese remind you of pizza?

For Extra Credit

Sense of smell can be an important tool for a detective. The captain of your department is worried that some of the detectives may not have a good sense of smell. She has a theory that people who drink a lot of coffee lose their sense of smell. The captain has asked you to develop an experiment to find out whether coffee drinkers have as good a sense of smell as people who don't drink coffee. Suggest an experiment that you could do to test the captain's hypothesis.

Science Sleuth Activity Package: Sniffing Out the Solution

Background

You've been identifying odors your entire life. Think about walking into the house just as a batch of chocolate chip cookies is coming out of the oven. It doesn't take you long to identify the aroma of cookies. Other kinds of odors tell stories too. People often wear colognes or perfumes whose odors may linger in a room as evidence of their visit. A house that smells stale and musty has its own story to tell.

This activity concentrates on the sense of smell, one of the five senses that help people understand their environment. (The other senses are taste, hearing, touch, and vision.) Smell is part of your body's olfactory system. The process of smelling begins when molecules or tiny particles of odorant break away and float into the air. When we inhale, we pull odorants inside the nasal cavity. Humans are sensitive to about ten thousand different odorants. There are plenty of odorant receptors inside the human nose. The roof of each nostril, the *nasal mucosa*, contains about 50 million odorant receptors in a layer called the *olfactory epithelium*. When an odorant particle enters the nose, it dissolves in watery mucus and sticks to little extensions of the cells called *cilia* in the olfactory epithelium. Each of the cilia contains specialized receptors that can bind to the odorants.

Once the odorant is bound in place, the olfactory epithelial cells send messages to the brain along *neurons*, or nerve cells. The messages travel as electrical signals. When the brain receives an electrical signal, it interprets the message. Sometimes the brain can identify a smell or even associate it with something else, like a taste. At other times, the smell is new to the brain.

In this activity, you will have an opportunity to find out what your nose knows!

Activity Directions

1. In your group, take turns smelling each container individually. The best way to smell is to pass the container two or three inches beneath your nose. As you do, close your eyes; it will sharpen your sense of smell.
2. As you finish smelling each odor, write what you think it is in the Data Table for Sniffing Out the Solution at the end of this activity package. If you're not sure, make your best guess. For now, don't share your findings with your partners.
3. Once everyone in your group has had a chance to smell every container, share your answers. If there are different opinions in your group, discuss the differences, and select one smell as the group's choice.
4. Ask your teacher to identify the smells.

Science Sleuth Activity Package: Sniffing Out the Solution, *Cont'd.*

Questions to Answer

1. Did either you or your group correctly identify all of the odors?

2. Are some members of your group better than others at identifying odors?

3. Which smells were the most difficult for members of your group to identify?

4. How well did you do distinguishing the different fruit juices?

Science Sleuth Activity Package: Sniffing Out the Solution, *Cont'd.*

Data Table for Sniffing Out the Solution

	Container	Substance, Individual Choice	Substance, Group Choice
A			
B			
C			
D			
E			
F			

Activity 1.6: Make a Note of It

Teacher Briefing

In this activity, students collect data through systematic observation. Then they think critically and logically to develop an explanation based on their notes. Although this is written as an activity for small groups, you could also use it as an assessment or evaluation device. If you decide to use this activity to assess student progress, do not hold the group discussion. Instead, collect the Science Sleuth Activity Packages to assess.

Activity Preparation

- Recruit two students or staff members to be Witnesses 1 and 2.
- Make copies of:
 - Science Sleuth Activity Package
 - Witness Statements 1 and 2 (if you want all students to have a copy of the statements), at the end of the Teacher Briefing

First, Tell Your Students . . .

Detectives record information in their notebooks when they work a crime scene. It might not seem exciting, but taking good notes is one of the most important things a detective can do. Notes help detectives remember clues and stories told by witnesses. Notes must be written neatly so others can read them—no “chicken-scratching” allowed! Long after a notebook is filled and a case is closed, the notebook is filed away so that it can be referred to in the future.

Activity Procedure

1. Distribute the Science Sleuth Activity Package, which includes the “Missing Scientists Crime Scene.” Give students a few minutes to study it.
2. Ask students to take notes as the Science Sleuth Activity Package instructs them.
3. Have Alisha read her witness card to the class. Students should take notes as she tells her story.
4. Have Michael read his witness card to the class. Students should take notes as he tells his story.
5. Tell students to follow the directions in their Science Sleuth Activity Package.

Summary and Discussion

Review the students' answers to the questions in their activity package, and discuss differences in them. Here is the key to the questions:

- Do you think that Florence and Isaac came into work today? Explain your answer. *Answer:* Yes. The evidence indicates that they arrived at the office.
- Is there anything missing from the lab? *Answer:* The growth factor is missing.
- Is there any sign of foul play? *Answer:* No.
- What are some possible explanations for the disappearance of Isaac and Florence? *Answer:* Answers will vary.
- What time do Alisha and Michael usually arrive at work? *Answer:* 3:00 P.M.
- What was the last time that Isaac made an entry in the logbook? *Answer:* 10:00 A.M.
- Do you think the missing scientists have been gone for more or less than one hour? Why? *Answer:* More than an hour. Their morning coffee is still on the desk. Neither of them opened their lunch bags.
- Did the owner of the briefcase call the bakery? Did he attend the birthday party? How do you know? *Answer:* The unopened lunch bags indicate that they left before lunch. The call to the bakery was scheduled for 2:00. So the owner of the briefcase probably never called the bakery.
- (a) What time does the mail usually arrive? (b) Had it been picked up by Isaac or Florence? *Answer:* (a) 11:30 A.M. (b) No.
- When do you think the crime occurred? In other words, exactly when do you think Florence and Isaac disappeared? *Answer:* They probably disappeared between 10:00 and noon.

Witness Statement 1, Alisha

Michael and I work the 3:00 P.M. to 11:00 P.M. shift. We replace Isaac and Florence, the 7:00 A.M. to 3:00 P.M. guys. When we got in today, they were nowhere to be found. We don't know if they even showed up for work! They hadn't picked up today's mail in the front office, which usually arrives at 11:30 A.M.

Witness Statement 2, Michael

I was supposed to help Isaac finish our experiment on a new plant growth formula. He told me to get here a little early today so that he could show me how to check on the experiment every hour.

Science Sleuth Activity Package: Make a Note of It

Background

One of a detective's most important jobs is to take notes. It takes practice to become a good note taker. Detectives learn to compose their notes in short, clear sentences that can be easily understood. Well-written notes avoid vague terms like *close to* or *about*. Instead, detectives try to be specific in their descriptions, using sentences like, "The size 12 black leather men's shoe was found six inches from the front door," instead of, "The big shoe was near the front door."

A crime scene is the place where an investigation begins, so a detective takes lots of notes there. Most of the evidence associated with a crime is located at the scene, so the sooner the detective arrives and starts taking notes, the better. Over time, a crime scene changes: people walk through it, air currents blow evidence away, and fingerprints get smudged. It's easy for some of the evidence to be lost or damaged. Good notes help save information about the condition of the scene at the beginning of the investigation.

The Case

Two scientists are missing, and so is their experiment! It's your job to interview the witnesses and get to the bottom of this dilemma.

Activity Directions

1. Look at the "Missing Scientists Crime Scene" picture at the end of this package; examine it carefully for clues.
2. Make notes here:

The date and time:

The type of crime or event that has occurred:

The location of the crime scene:

The people present at the crime scene:

Science Sleuth Activity Package: Make a Note of It, *Cont'd.*

3. Listen to Alisha's witness statement and make notes here about her story.

4. Listen to Michael's witness statement and make notes here about his story.

5. If your teacher has assigned you to a group, you may discuss the crime with the other students.

6. Answer the following questions:

Do you think that Florence and Isaac came into work today? Explain your answer.

Is there anything missing from the lab?

Is there any sign of foul play?

What are some possible explanations for the disappearance of Isaac and Florence?

Name _____ Date _____

Science Sleuth Activity Package: Make a Note of It, *Cont'd.*

What time do Alisha and Michael usually arrive at work?

What was the last time that Isaac made an entry in the logbook?

Do you think the missing scientists have been gone for more or less than one hour?
Why?

Did the owner of the briefcase call the bakery? Did he attend the birthday party?
How do you know?

What time does the mail usually arrive? Had it been picked up by Isaac or Florence?

When do you think the crime occurred? In other words, exactly when do you think
Florence and Isaac disappeared?

Science Sleuth Activity Package: Make a Note of It, *Cont'd.*



Copyright © 2007 by John Wiley & Sons, Inc.

Missing Scientists Crime Scene

Activity 1.7: Handwriting Never Lies

Teacher Briefing

Students probably think they write their signatures with their hands. It's called "handwriting," after all. In this exercise, they'll learn that the brain also plays a role in how their signatures look. They will also learn one basic tool of handwriting analysis.

Activity Preparation

- Make copies of the Science Sleuth Activity Package.
- Provide each student with:
 - Tracing paper
 - Ruler

First, Tell Your Students . . .

Sometimes a handwritten document is used as evidence in a crime. A ransom note, for example, may be helpful in identifying a kidnapper. In other cases, detectives may suspect that an important document has been forged. Such a "questioned document" must be analyzed to see if the author is who he or she claims to be. When there is a question of who wrote something, known handwriting samples and questioned documents can be compared.

Handwriting samples are useful to detectives because no two people write exactly alike. A person's one-of-a-kind handwriting comes from the unique qualities of his or her brain and muscles. This individuality is so strong that handwriting can be used for identification.

Activity Procedure

1. Distribute the Science Sleuth Activity Package.
2. Ask students to turn to the section in the Science Sleuth Activity Package labeled "Writing Samples."
3. Tell students to write their name in the usual fashion in space 1.
4. Now ask them to clench their fist and slip the pen or pencil inside so that all four fingers are curved around it. Demonstrate. Explain that this changes the muscles that control their writing. They should write their name again, this time with the clenched fist.
5. Ask students to hold the pen in the crease of their elbow. Demonstrate. Explain again that different muscles are controlling their writing. They should write their name again, this time with the pen in this position.
6. Now ask students to compare the three signatures. They might want to share with other students so that everyone can observe similarities and differences.

7. Point out that while the second two signatures may not be as neat as the first, the general pattern of the signature comes through in all cases.

Now, Tell Your Students . . .

When detectives compare handwriting samples, there are several things they look at: the shape of the letters, the way they slant, and how they connect to each other. The thickness of the line, or line quality, may also be helpful. The way people arrange words on the page and their manner of spelling, grammar, and phrasing can give clues.

Activity Procedure

1. Distribute tracing paper as needed.
2. Ask students to turn to the page in their Science Sleuth Activity Package that is headed “The Case.”
3. Ask students to follow the directions on their Science Sleuth Activity Package to examine the note from Ms. McIntosh and see if it matches other samples of her handwriting.

Summary and Discussion

- Ask students: Did Ms. McIntosh write the note Melissa gave her teacher? How can you tell?
- Discuss with students the process they used to compare the signatures. You might ask them to go through the steps of the experiment with you so they understand the scientific method they followed.
- Is it hard or easy to forge someone’s signature? *Answer:* Hard; every person’s signature is unique.
- What body systems are important in writing? *Answer:* The brain and muscles of the arm and hand.

Science Sleuth Activity Package: Handwriting Never Lies

Background

Sometimes a handwritten document is used as evidence in a crime. A ransom note, for example, may be helpful in identifying a kidnapper. In other cases, detectives may suspect that an important document has been forged. This is called a *questioned document*, and it must be analyzed to see if the author is who he or she claims to be. When there is a question of who wrote something, known handwriting samples and questioned documents can be compared. Handwriting samples are useful to detectives because no two people write exactly alike. A person's one-of-a-kind handwriting comes from the unique qualities of his or her brain and muscles. This individuality is so strong that handwriting can be used for identification.

Handwriting is a complex activity that begins in the brain. Before you start to write, the brain makes a mental picture of how the words and letters will look. Nerves carry that mental picture from the brain, down the arms, and to the hands. The muscles and nerves work together to do the writing, but it never looks exactly like the original mental picture.

Today, we're going to do a little experiment that will offer proof that handwriting is controlled more by the brain than by the muscles. We start with the "Writing Samples" section.

Writing Samples

1. In this space, write your name as you usually do.
2. In this space, hold the pen or pencil in your fist, and write your name again.
3. In this space, hold the pen or pencil in the crease of your elbow, and write your name again.
4. Compare the signatures. Name two ways the signatures are similar. Name two ways they are different.

Science Sleuth Activity Package: Handwriting Never Lies, *Cont'd.*

The Case

Melissa McIntosh returned to science class on Wednesday after being absent on Monday and Tuesday. She presented a written excuse to Ms. Nance, her teacher, saying, "Here is a note from my mom, Betty Sue McIntosh, explaining my absence." A copy, "Note to Teacher," is included at the end of this package.

Ms. Nance is suspicious about the authenticity of this note. The handwriting resembles Melissa's, which makes Ms. Nance wonder if Ms. McIntosh did indeed write the note. Ms. Nance needs some help in handwriting analysis and has called on you!

Activity Directions

1. Perform a "top-of-letter handwriting analysis" on "Note to Teacher." To do this:
 - Place the tracing paper over Betty Sue McIntosh's signature.
 - Make a small dot on the tracing paper at the high point of each letter.
 - Use the ruler to connect the dots with straight lines. Write "Betty Sue" on the tracing paper next to this line.
2. Turn to "Signatures of Melissa and Her Friends" at the end of this package. Do the same thing to the signatures of the suspects: Melissa McIntosh and her best friends, Janine Scott, Reggie Defoor, and Patrice Wong. Make sure you label each line with the first name of the person whose signature it reflects.
3. Compare the zigzag line produced from Betty Sue's signature on the note Melissa brought her teacher to the zigzag lines from the suspects' signatures. Are any of them alike?
4. According to your signature analysis, was the note Melissa gave her teacher written by Melissa's mother, Betty Sue McIntosh? If not, who do you think wrote it?

Science Sleuth Activity Package:
Handwriting Never Lies, *Cont'd.*

Please excuse Melissa from school.
She had a bad cold and
I made her stay in bed.

Thanks, Betty Sue McIntosh

Note to Teacher

**Science Sleuth Activity Package:
Handwriting Never Lies, *Cont'd.***

melissa McIntosh
Janine Scott
Reggie DeFoor
patrice Wong

Signatures of Melissa and Her Friends

Activity 1.8: Comparative Handwriting Analysis

Teacher Briefing

In this activity, students handle a more sophisticated level of handwriting analysis than in Activity 1.7: they will analyze similarities and differences in handwriting samples and use their findings to draw conclusions. The lesson begins with a discussion of the role handwriting analysis played in the Lindbergh kidnapping case in the 1930s. You may omit this part of the lesson if you choose.

Activity Preparation

- Make several writing samples. Label one page “Sample A.” On that page, write:

Imagination is more important than knowledge.

Love all, trust a few. Do wrong to none.

1 6 9 2 \$

A D L I

k w t

Either you or your helper should write the following on a third piece of paper: “Please give David Alpert \$1,692 from my bank account at Lincoln Bank. I know I should come myself, but I’m working on my keepsake chest, and I need the money for paint and other materials. Thanks in advance, Lola Applegate.” Label it “Bank Note.”

- Make copies of:
 - Writing Samples A and B
 - Bank Note
 - Science Sleuth Activity Package
 - Lindbergh Ransom Note
- Make sure all students have a ruler.

First, Tell Your Students . . .

Detailed analysis of handwriting is important any time the author of a note needs to be identified. Handwriting analysis is used to authenticate the authors of everything from notes, wills, and bills of sale to ransom notes.

Detailed handwriting analysis played an important role in the Lindbergh kidnapping case. Although it happened a long time ago, it is still one of the most notorious kidnapping cases in American history.

In 1934, the child of Charles and Anne Lindbergh was kidnapped. Charles Lindbergh was the first to fly a plane nonstop across the Atlantic Ocean, and he was a hero around the world. An envelope found after the kidnapping contained a single sheet of folded paper. The message on the paper is shown in the “Lindbergh Ransom Note.” (Distribute the note to the students.)

Handwriting experts used this ransom letter, with all of its peculiar spelling and loopy letters, to help prosecute the kidnapper. They compared the handwriting in the letter to the handwriting of the primary suspect, Bruno Richard Hauptmann. Hauptmann was found guilty, sentenced to death, and executed. (In fact, to this day, doubts still linger as to whether Hauptmann was guilty.)

Activity Procedure

1. Hand out the Science Sleuth Activity Package, including Writing Samples A and B and the Bank Note.
2. Tell students to follow the directions to see if David was telling the truth.

Summary and Discussion

- Ask students whether the Bank Note was a forgery. You might want to have a show of hands as students may have reached different conclusions.
- Would you agree or disagree with the following statement: “People vary their handwriting slightly each time they write”?
- Ask students to suggest some ways you can tell that a sample of handwriting is forged. Students might suggest using over-the-top analysis, height-of-the-letters analysis, or distance-between-words analysis.

Dear Sir!

Have 50,000 \$ ready with 25,000 \$ in
20 \$ bills 15000 \$ in 10 \$ bills and
10000 \$ in 5 \$ bills. After 2-4 days
we will inform you were to deliver
the money.

We warn you for making
anything public or for notify the police
the child is in quite care.



Lindbergh Ransom Note

Science Sleuth Activity Package: Comparative Handwriting Analysis

Background

Detailed analysis of handwriting is important any time the author of a note needs to be identified. Handwriting analysis is used to authenticate the authors of everything from notes, wills, and bills of sale to ransom notes.

Handwriting analysis is a useful tool detectives use in finding criminals, and it serves as evidence in court. Because it is so important, handwriting experts have developed several tricks of the trade. They sometimes compare handwriting samples using measurements and sharp-eyed inspections. These techniques can reveal characteristics that might be missed in the very basic top-of-letter analysis you used in a previous activity. Today you are going to learn some additional tools of handwriting analysis.

The Case

David Alpert showed up at the Lincoln Bank with a note from his neighbor, Lola Applegate. As you can see, he was asking for a considerable sum of money, so the bank wanted to be sure the note came from Lola (Writing Sample A). They had a writing sample from Lola, and they asked David to write the same words and letters on a piece of paper (Writing Sample B).

Activity Directions

1. Look at the Bank Note provided by your teacher. Then examine Writing Sample A and Writing Sample B.
2. As you begin to examine the Bank Note and the writing samples, keep a record of your findings on the data table.
3. You might begin by looking at the capital letters in samples A and B. For example, measure the height above the line of the capital letter "L." (If the letters are not all the same size, find the height above the line of each example of the letter, then find the average height.) Enter the height (or average height) on the data table in the appropriate column: Sample A or Sample B. The data table is at the end of this package.
4. Measure the height of the letter "L" in the Bank Note. Enter this on the data table.
5. Put a check mark next to the height in the Sample A and Sample B columns that is the closest to the height in the Bank Note.
6. Repeat steps 3 through 5 for the other letters and numbers, and enter your findings on the data table.

Science Sleuth Activity Package: Comparative Handwriting Analysis, *Cont'd.*

7. How much space is there between each word in Writing Sample A and Writing Sample B? (If the distance between words varies, find the average distance.) Compare this to the space between words on the Bank Note. Put a check mark next to the distance in the writing sample that is most similar to the Bank Note.
8. You have compared the Bank Note to the Writing Sample on 10 different points. Based on the information in your data table, which Writing Sample is more like the Bank Note? If your results are not conclusive, compare some other letters.

9. Based on your findings, would you say that the Bank Note is authentic or a forgery?

Name _____ Date _____

Science Sleuth Activity Package: Comparative Handwriting Analysis, *Cont'd.*

Data Table for Comparative Handwriting Analysis

Height of Character	Sample A	Sample B	Bank Note
L			
D			
I			
k			
w			
1			
6			
9			
\$			
Space between words			

Copyright © 2007 by John Wiley & Sons, Inc.

Activity 1.9: In the Dark— Homework Assignment

Teacher Notes

This interesting activity helps students understand how their eyes work. It's something easy to do in the home, and they might enlist family members to help. This is a good activity for partners, and it may be possible for students to team up and work together at home on this, then bring their codes to school and share them with other students.

Answer Key

5. By waiting fifteen minutes, the rods were able to begin to fully function, helping the eyes adapt to the light.
6. The variable was whether light was present in the room.
7. Answers will vary. One possible hypothesis: you can see better in the dark if your eyes have time to adjust to low light.

Homework Assignment: In the Dark

In this assignment, you observe objects under two different conditions, or *variables*.

The subject of this experiment is vision: How well can you see in the dark? In the first condition, you will leave a room that is well lighted and enter a room that is dark, looking for a hidden object. In the second condition, you will go from a darkened room into another darkened room, looking for the same object.

Can you guess what the variable in this experiment is?

Background

A dark area can be a tough place to investigate. In the dark, a detective might have trouble identifying objects. However, crimes don't always conveniently happen in the daytime, so detectives must learn to do their investigating even when the lighting is poor. There are a few tricks of the trade that help investigators when lighting is low.

Humans depend more on their sense of sight than any other sense. We are able to see because light passes into the eye and strikes a layer of sensitive cells on the back of the eyeball. The front of the eye is covered by the clear, tough cornea. Light travels through the cornea, then through the pupil and lens before it gets to the retina in the back of the eyeball. The amount of light that enters the eye is controlled by the iris, a circular muscle. The retina contains cells that respond to light by generating electrical impulses. These impulses travel along the optic nerve to the brain, where they are interpreted.

There are two types of cells in the retina: rods and cones. These cells were named for their appearance under the microscope. Humans have more rods than cones. Rods are very sensitive to light, so they specialize in forming images when light is dim, and they see only black and white. When an investigator is in a dimly lit room, his or her rods are working overtime. Since rods are not good at distinguishing details, everything looks a little gray and fuzzy in dim light.

Cones require a lot of light to function. These cells can detect the three primary colors: red, green, and blue. All of the other colors are produced when the brain mixes these three basic tones. So during the daytime or in a well-lit room, eyes use the brightest rays available and depend on their cones.

Both rods and cones contain light-sensitive pigments. When light hits the pigments, they change shape and set off a series of chemical changes in the cells that generates an electrical signal.

In this exercise, you'll learn how to carry out a search in low light. You may be surprised to discover what your eyes can—and can't—see at night!

What You'll Need

- Two adjoining rooms, perhaps two classrooms at school or a living room and dining room at home. It should be possible to light both rooms. It's easiest to do this experiment at night, when you can make a room dark by just turning out the lights.
- A partner.

Homework Assignment: In the Dark, *Cont'd.*

- An object that can be hidden in plain sight. This should be not too large or small, perhaps the size of a cell phone, a wallet, or a coffee cup.
- A watch or clock with a second hand.

Activity Directions

1. Darken one room, and leave the lights on in the other.
2. While you stay in the lighted room, give your partner an object to place in the darkened room. It should be in plain sight—somewhere that it could be easily seen if you turned on the lights.
3. Check the time, and make a note of it. _____
4. Have your partner watch the clock while you enter the darkened room and look for the object. When you find it, call out “Time!”
5. Record here how long it took you to find the object. _____
6. Now darken both rooms, and wait at least fifteen minutes in the same room that was lighted in the first part of the experiment.
7. Ask your partner to place the object in the other room—in the same room but not in the same place as before.
8. Have your partner watch the clock while you enter the second room and search for the object. When you find it, call out “Time!”
9. Record how much time it took to find the object the second time. _____

Questions to Answer

1. How long did it take you to find the object when you walked from a lighted room into the dark room?

2. How long did it take you to find the object when you walked from a dark room into another dark room?

Homework Assignment: In the Dark, *Cont'd.*

3. Which was easier to do?

4. Why do you think this was so?

5. Why do you think it was important to wait fifteen minutes before you went to search in the second part of the experiment?

6. Now can you guess what the variable was in this experiment?

7. Can you make a hypothesis based on what you found?

8. What's another experiment you could use to test this hypothesis?

Activity 1.10: Secret Codes— Homework Assignment

Teacher Notes

This assignment is a good activity for partners, and it may be possible for students to team up and work together at home on this. Then they can bring their codes to school and share them with their classmates.

Answer Key

1. The ten code system is quick, easy, and efficient.
2. Answers will vary. Detectives with their own secret code might be able to communicate quickly without giving away info to a suspect.
3. Answers will vary. Hand signals, poses, facial expressions, words, and phrases might make up a code.

Homework Assignment: Secret Codes

Background

A code is another way of communicating, a way that doesn't use conventional languages like English or Spanish. For example, people who are hearing impaired use a set of coded hand signals or sign language. Codes can be used to communicate over distances. Native Americans used smoke signals to send messages from camp to camp.

Modern detectives often use the verbal "ten code" system that has been standardized for messages. For example, "Code 5" means "stakeout," "207" stands for a kidnapping, and "503" represents a stolen vehicle. The code is often shorter than saying the whole thing, and besides, people who aren't police probably won't know what the officers are saying to each other.

One of the best-known codes in the world is Morse code. Samuel Morse (1797–1878) worked for several years to develop a system of dots and dashes that could be used to send messages across hundreds of miles. Used over the telegraph wire, the sound of a short tone stands for a dot and the sound of a long tone represents a dash. Each letter of the alphabet is made up of its own combination of dots and dashes. In Morse code, the message "See you tomorrow" is **... .. — . — — — — . . — — — — — — . — . . . — — — . — —** You can also use Morse Code with a flashlight, turning it on and off quickly for a dot, and leaving it on longer for a dash.

Activity Directions

1. Using the Morse Code in the table at the end of this homework package, write out a short message in this code.
2. Using a flashlight, try sending this message to your partner across a room or yard. See if your partner can figure out what you said.
3. Like the police, you and your partner can make up a special code of your own. Think about five or six simple messages you might want to send.
4. Develop a flashlight code for sending that message. The code can be based on the number of times the light is flashed, the rate at which the light is flashed, or even movements of the light. Here are some ideas:

Word or Message

Come here.

Wait there.

Meet me at headquarters

Code

Two quick flashes

Three quick flashes

Move light up and down from ceiling to floor

Name _____ Date _____

Homework Assignment: Secret Codes, *Cont'd.*

5. Write your code down on this page. Be prepared to demonstrate your code in class.

Copyright © 2007 by John Wiley & Sons, Inc.

Questions to Answer

1. Why do detectives use the ten code system when they talk on their radios?

2. How could you use a secret code to help solve a case?

3. Flashlights are one way to send a code. What are some other ways?

Homework Assignment: Secret Codes, *Cont'd.*

Morse Code	
A .—	U ..—
B —...	V ...—
C —.—.	W .— —
D —..	X —..—
E .	Y —.— —
F ..—.	Z — —..
G — —.	
H 	1 .— — — —
I ..	2 ..— — —
J .— — —	3 ...— —
K —.—	4 —
L .—..	5
M — —	6 —
N —.	7 — — ...
O — — —	8 — — — ..
P .— — .	9 — — — — .
Q — — .—	0 — — — — —
R .—.	Period .— .— .—
S ...	Comma — — .. — —
T —	Question Mark .. — — ..