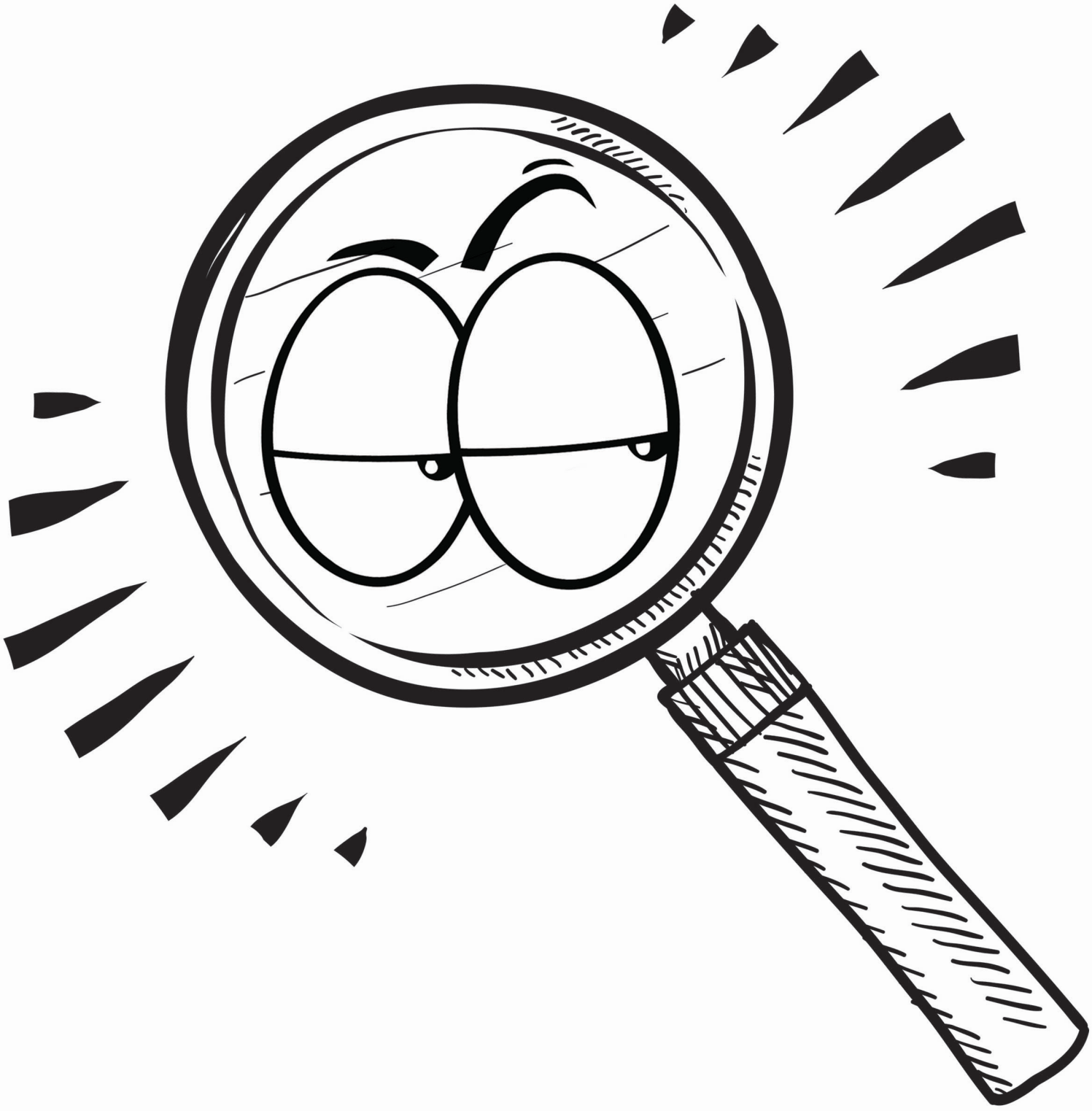
Table of Contents



Preface

Welcome!

Missing Money Mystery: An Introduction to Forensic Science is a 12-lesson course for elementary students. It is designed to ignite curiosity and stimulate authentic learning by creating real life contexts ranging from lab analyses to print making to criminal investigation. *Missing Money Mystery* has been used enthusiastically in all 50 states, stimulating young minds and engaging young hands for many years. In fact, thematic integration—over an extended period of hands-on engagement—forms the driving concept behind all Community Learning's courses. The lessons and activities that comprise *Missing Money Mystery* are aligned to the practices, cross-cutting concepts, and disciplinary core ideas that are the foundation of the Next Generation Science Standards (NGSS). In addition, the activities included in this unit align to the Common Core State Standards in Mathematics and English Language Arts and Literacy. For more information on the standards please see the Standards Matrix included in the appendix.

Who Can Teach *Missing Money Mystery* and Where?

Instructors are supported by easy-to-manage materials and step-by-step plans. No specialized knowledge is required to launch the course, making this entertaining forensic science mystery ideal for classrooms, after-school programs, intersession programs, museum groups, summer camps, youth groups, and clubs . . . anywhere young people are gathered.

Hands-on Enrichment in Science and Critical Thinking

The call for hands-on activities that build critical thinking skills, confidence, competence, and science literacy can be heard on the national, state, and local levels. To be sure, educators and officials in both the public and private sectors point to the critical role ongoing, quality after-school programs play, especially programs with a focus on science, math, and reading—the same skills now tightly linked to the economic productivity of our society.

Missing Money Mystery exposes students to this and more. The course sets up scenarios that invite students to solve problems creatively, think critically, work cooperatively in teams, and use evidence, models, tools, and scientific techniques effectively.

> *"The students were engaged and enjoyed the experiments. The story keeps the activities meaningful and provided an interested way to connect standards. The teacher's manual was easy to follow and materials in the kits made it very convenient for set up. Overall, this is a great thing to do in afterschool and during the summer!"*
>
> - Genesis Center, Florida

Bringing the Mystery to Life

Missing Money Mystery is based on the premise that a crime occurred in Mr. Mugg's fourth grade classroom at Markwell Elementary. A canister holding the money for an upcoming geocaching field trip disappeared sometime after dismissal on a Monday afternoon. Mr. Mugg makes this discovery the following morning. He knows his students have been looking forward to this special trip which will introduce them to the natural world through a real life treasure hunt, and he decides to undertake the investigation himself—with the help of your (the course instructor's) students.

To launch his investigation, Mr. Mugg uses the classroom computer to learn about forensic science and the necessary activities, tools, and tests he needs to solve the crime. He shares this information with your students through a series of email letters. He then locates and gathers the clues and packages and sends them in a box to your classroom. Inside this

box are all the materials needed by your students to conduct the investigation, including photographs, scientific equipment and "evidence."

Each lesson introduces new intriguing evidence, forensic techniques, and insight toward solving the *Missing Money Mystery*. To limit the suspect possibilities, Mr. Mugg has narrowed the suspects to four—all current students of his. Two are boys and two are identical twin girls. Together, your students work toward the most plausible scenarios and celebrate their findings in the concluding lesson with certificates honoring their work as forensic investigators.

"The Missing Money Mystery was very easy to follow. The children had such a great time at it, we even allowed our group to re-enact the entire crime. This mystery was fantastic!"

- Jacqueline Jones-Ford, Director/Detective, Hempstead NY P.A.L.

Making the Most of Each Lesson

With all the necessary materials provided in convenient, lightweight carryalls, and the setups, processes, and procedures explained in detail, instructors will find *Missing Money Mystery* easy and fun to teach. Each lesson provides an activity that teaches a new but related aspect of scientific reasoning and a particular scientific process. None of the labs require special handling or complicated setups.

After familiarizing themselves with the lesson, vocabulary, and intended outcome of the activity, instructors set up their classroom so that it is easy for students to work in groups. Clear guidance is provided in each lesson on how to set up the demonstration area with all the relevant materials at hand.

Any necessary safety precautions specific to individual lessons are also provided. The instructor should be sure to know where emergency help and supplies are located.

Each lesson activity that the students accomplish becomes part of their "Case Notes" and contributes, ultimately, to solving the mystery. Because of this, instructors need to review the corresponding pages in the Student Activity Book in order to guide students in completing their part of the activity.

Course Kit Components

Each course kit contains an Instructor Guide and Teacher Resources on a thumb drive (referred to through this guide simply as "Resources"). The thumb drive contains a PDF version of the Instructor's Guide, Student Book, Handouts, Supply Lists, Safety Sheets, and video links.

The Missing Money Mystery: Teacher Resources and QR Code

Our online resources provide instructors with an in-depth guide to *The Missing Money Mystery*, ensuring that both the instructor and the students are able to make the most out of this one-of-a-kind crime scene investigation. This resource page includes an introduction to the course, the Preparation Overview, Lesson by Lesson Training, Video Tutorials, access to the Instructor's Guide, the Student Book, along with the Student Handouts. To access these helpful resources, scan the QR code below or visit **https://blog.commlearning.com/** to get started!

Instructor's Guide

Every step is taken to provide an easy-to-follow format and fun-to-read instructions for each lesson. In addition to a brief listing of objectives, materials, and setup procedures, useful icons point the instructor to a number of key elements:

Notes for the Instructor

Brief instructor notes introduce the subject matter and challenges presented in the particular lesson. They often contain real-life, age-appropriate examples from crime in history or popular culture.

Notes for the Students

These notes "set the stage" for each lesson by presenting brief material to read, listen to, and discuss.

Vocabulary

New and relevant terms are defined here. Note, too, the comprehensive "Glossary" at the rear of the Instructor's Guide and Student Books.

Activity Description

Here, step-by-step procedures are provided for both the instructor's demonstration and the students' immersion in the activity.

Wrap-up

Discussion-provoking questions are designed to summarize learning and help students take their inquiry further.

Clean-up

Clear instruction on preserving and storing materials is provided to ensure kit longevity and cost effectiveness.

Other Directions, Discussions and Destinations

To extend lessons and deepen understanding across disciplinary and cultural divides, relevant links to multimedia, web resources, and books are provided here.

Student Books

Designed for students to record their discoveries class after class, the Student Books acquire a narrative quality that keeps the young "Crime Scene Investigators" engaged in scientific investigation over time. The books serve as companions to the Instructor's Guide and contain reports, charts, places to attach samples, and areas to record observations, as well as a full glossary of terms used in the course.

The complete *Missing Money Mystery: An Introduction to Forensic Science* student book is provided in PDF in Resources for your individual use.

Companion Resources

When you adopt *Missing Money Mystery: A Study in Forensic Science*, your instructors will have access to a number of companion resources. The resources offer tips, lesson extensions, and other great ideas for the classroom. Word search and crossword puzzles help reinforce newly learned and used vocabulary. Links to forensic videos and other multi-media resources provide authentic lesson extensions. Immediate support is always available by phone, email, or webinar from the experts at Community Learning.

About Community Learning

At Community Learning, we believe learning should be a journey fueled by curiosity, so we create and curate hands-on learning kits and partner with organizations that share our vision for exploration-based education. Instead of traditional textbooks, our activities and resources get learners doing, thinking, and exploring—whether they're aspiring scientists, storytellers, or makers—while building critical thinking skills through engaging challenges and real-world problem-solving. Working alongside outstanding educators and experts, we carefully select and develop kits and products that inspire through engagement and fun, helping parents and educators nurture their learners' natural curiosity in ways that spark discoveries that could last a lifetime. Together, let's engage, expand, and inspire the next generation of lifelong learners.

If you have any questions, suggestions, or feedback, please visit our website or email us at **info@commlearning.com.**

Preparation Overview

	Lesson 1 Figuring Out Forensics: Organization and Observation	Lesson 2 Securing the Scene: Collecting Evidence	Lesson 3 Powder Power: Solutions or Suspensions	Lesson 4 Natural or Not: Fiber Identification
Print/Copy	Student Book pages iii-3	Student Book pages 4-6	Student Book pages 7-15	Student Book pages 16-19
Organize Kit Supplies	• Black marker • Plastic coins • Plastic cups • Paper bags • Textured objects • Pencils • Rulers • Hand lenses	• Crime scene tape • Measuring tape • Masking tape • Black marker • Graph paper • Sand • Membership card • Wipes • Lotion • Pencils • Rulers	• Black markers • Masking tape • Portion cups • Wipes • Container • Vinegar • Funnel • Dropper bottles • Wooden splints • Plastic cups • Dark construction paper • Tablespoon • White powders (baking soda, Plaster of Paris, powdered sugar, salt) • Light colored construction paper • Pencils • Hand lenses • Foam plates • Scissors	• Black fabrics (nylon, acetate, cotton, wool) • Aluminum tray • Container • Votive candles • Tweezers • Metal tongs • Wide tape • Black marker • Light colored construction paper • Scissors • Pencils • Hand lenses
Prepare	• Organize bags of textured objects • Count coins into cups	• Organize the mock crime scene in your room • Create a mock crime scene sketch - make copies for each student • Attach crime scene tape across doorway	• Organize powders into portion cups and place on labeled construction paper • Fill and label dropper bottles with water and vinegar • Set up demonstration area	• Cut and prepare fabric samples on labeled construction paper • Tear pieces of tape and set on edges of student desks or tables • Fill the container with water as a safety precaution • Set up pyrolysis demonstration
Acquire Additional Supplies			• Water	• Matches

Preparation Overview

	Lesson 5 Tracking the Tires: Tread Patterns	Lesson 6 Digging for Dirt: Soil Samples	Lesson 7 Cast a Clue: Shoe Print Evidence	Lesson 8 Crack the Code: Cryptograms
Print/Copy	Student Book pages 20-24	Student Book pages 25-27	Student Book pages 28-33	Student Book pages 34-39
Organize Kit Supplies	• Wipes • Masking tape • Rulers • Reclosable bags • Modeling clay • Pencils • Tire sample • Hand lenses • Foam plates • Photos of tread evidence and cast of tread evidence • 8 oz. plastic dish • Plaster of Paris tub • Portion cups • Plastic spoon • Cup of water • Scissors	• Soil samples (sandy soil, clay, loam) • Wipes • Black marker • Portion cups • Container • Dropper bottles • Foam plates • Tablespoon • Pencils • Hand lenses • Wooden splints	• Scrub brushes • Shoe shine sponges • Paint brushes • Dusting powder • Photos of crime scene shoe print • Portion cups • Wipes • Hand lenses • Pencils	• Index cards • Black marker • Masking tape • Photos of coded note • Pencils
Prepare	• Separate modeling clay into bags for each group of students • Make a mold/cast at least 1 hour before class begins • Set up demonstration area to make a second mold/cast	• Label portion cups and scoop soil samples • Fill dropper bottles with water • Set up foam plates with soil samples for each group	• Fill portion cups with dusting powder • Set up shoe printing stations	• Write letters and numbers on index cards for deciphering cryptogram
Acquire Additional Supplies	• Cooking spray • Paper towels • Water	• Paper Towels • Water	• Paper Towels • Blank Copy Paper	

Preparation Overview

	Lesson 9 **Lifting Lips: Lip Prints**	Lesson 10 **Proof in Profiling: DNA Identification**	Lesson 11 **Suspicious Statements: Means, Motive, Opportunity**	Lesson 12 **Case Closed: Analyzing Evidence**
Print/Copy	Student Book pages 40-45	Student Book pages 46-48	Student Book pages 49-50	Student Book pages 51-53 Certificates of Completion
Organize Kit Supplies	• Portion cups • Wooden splints • Powder (cornstarch) • Lipstick • Petroleum jelly • Wide tape • Index cards • Black marker • Wipes • Photos of lip print on Envelopes • Pencils • Mirrors • Feathers • Rulers • Hand lenses • Crayons • Rolls of tape • Tissues	• DNA strands handouts • Envelopes • Scissors • Rolls of tape • Pencils • Photos of blood drops from crime scene	• Pencils	• Pencils
Prepare	• Scoop lipstick and petroleum jelly into portion cups for each student • Fill portion cups with powder • Label index cards with lip print patterns	• Set up DNA cutting demonstration	• Organize groups of students	• Print out and fill in the Certificates of Completion
Acquire Additional Supplies				

Lesson 1

FIGURING OUT FORENSICS

ORGANIZATION AND OBSERVATION

Lesson 1

Figuring Out Forensics: Organization and Observation

OBJECTIVES

Students will:

- Use senses to record written observations
- Apply the properties of shape, texture, size, color, odor, and sound to record observations
- Use written information to identify objects
- Collect data through the use of measurement

MATERIALS

Instructor:

- black marker
- plastic coins
- 15 plastic cups
- 15 paper bags
- 15 textured objects

Students (per pair):

- Student Book
- 2 pencils
- 1 ruler with inches and centimeters
- 1 cup of coins (5 in each)
- 1 magnifier
- 1 paper bag with 1 textured object inside
- 1 black marker

PREPARATION

1. Organize 15 bags of textured objects.
   - ➔ Number the bags one through fifteen.
   - ➔ Put 1 object into each of the bags.
   - ➔ Fold top over securely.
2. Put 5 coins into each of 15 cups. Try to have 2 similar coins in each cup. (similar colors, similar sizes etc).
3. Assemble student materials.
4. Group students in pairs.

Notes for the Instructor

In these opening activities, students are introduced to a crime that has taken place in Mr. Mugg's classroom and to the process of criminal investigation. Students work in pairs and groups to practice their observational skills on a variety of objects. They record their observations in the form of lists and data tables and refer to the properties of different coins—color, texture, shape, size, and image—to complete the tables. In addition to the use of their physical senses, the students measure using rulers and the appropriate abbreviations for specific units. It is crucial that students observe and record the details of evidence accurately. These skills are evaluated over the course of the students' work as they attempt to identify specific objects based on their peers' data.

While "science" is defined as the study of the natural and physical worlds through observation and experimentation, "forensic science" is science applied to evidence. This evidence and other information discovered through the activities of forensics can be used in court. In fact, "forensic" derives from *forensis*, Latin for "forum," meaning a public meeting place for discussion. In Ancient Rome, if a citizen was accused of a criminal act, his or her case had to be presented in public. Both the accused and the accuser were required to deliver speeches presenting their sides of the story. The final decision in the case rested on the party who presented their information most convincingly.

Different kinds of scientists can be part of forensic study. **Forensic anthropologists** are responsible for the recovery and identification of skeletal remains. Conducting DNA testing of body fluids for the purpose of identifying an individual is one job of a **forensic biologist**. Soil, mineral, and petroleum evidence are handled by **forensic geologists**. **Forensic odontologists** study teeth—their development, structure, and diseases. **Forensic pathologists**, often appearing on television shows, study diseases and changes in the body to determine the cause of death. Analyzing the effects of drugs and poisons on a body is the responsibility of **forensic toxicologists**.

One of the first instances of using forensic science in a legal case took place in Harwick, England in 1016.

A maid had been assaulted and drowned. Footprints and an impression made by corduroy fabric were found near the scene; the impression showed that a patch had been sewn on the fabric. Wheat particles were also found in the area. Based on the distinctive shape of the patch revealed in the impression and the wheat particles, a man who worked in a local wheat field was convicted of the crime.

Crime scene investigators learn to make keen and accurate observations using all of their physical senses as well as specialized tools and equipment. They then tackle the process of recording the observations accurately and completely. These records may take the form of notes or drawings, such as a crime scene map. Qualitative information, such as eye and hair color, is included. Information related to numbers of any kind, such as the height and weight of a suspect and the number of suspects involved, is referred to as quantitative data.

The crime scene investigator plays an important role in the legal process and often testifies during trials. If evidence or information is incomplete or mishandled, the guilty person could be set free.

The more facts and details the investigator can supply, the more likely the correct suspect will be convicted. In these opening activities, your budding crime scene analysts will have an opportunity to exercise the observations skills critical to a successful investigation.

The activities in this lesson address Next Generation Science Standards practices of Asking Questions and Defining Problems and Planning and Carrying Out Investigations. In addition, they address Common Core State Standards CCSS.ELA-Literacy. CCRA. SL.1 and CCSS.Math.Content.3.MD.B.4. See the Standards Matrix included in the appendix for more detailed information.

Notes for the Students

Read to your students the following note from Mr. Mugg, found in the box of supplies he has sent. Students can follow along in their books.

Dear Students,

I want to begin by thanking you very much for your willingness to help me solve the mystery of the missing geocaching trip money. Not only are you great problem solvers and observers, according to your instructor, but you're far away from where the crime took place. This makes you the perfect candidates to help get to the bottom of this crime. Inside this box I sent, you will find various clues and tools: bags of evidence, photographs, supplies for forensic testing, and notes that contain both factual scientific information as well as my own personal commentary on what I am learning about the crime that took place in my classroom at Markwell Elementary.

Quickly, before my students arrive, I'd like to share what I learned from the website of the Federal Bureau of Investigation, or the FBI, the government agency that helps protect our country against crime.

First, I learned that forensic science is made up of lots of different kinds of science. It draws on all the science it can to solve crimes: chemistry, biology, geology and other fields. All sorts of **forensic scientists**—from those who specialize in parts of the earth to those who specialize in parts of the human body—help during an investigation. They work together as a team, and the information they present must be the result of careful **observations**. Forensic scientists are trained to use special tools AND their own five senses to make these observations, which can used in a court during a criminal trial.

Second, I learned that forensic scientists must make careful observations of the **properties** of evidence. Properties might be size, color, shape, texture, or how something smells or tastes. All of this information, or **data**, must be written down in some way. Charts, lists, drawings and graphs are some ways to record data. Eventually, this data could be presented in court, so it needs to be accurate and detailed.

Let's start by practicing the observational skills you're going to use to be the best forensics investigators you can be. You'll work in teams and record your observations carefully, just as real forensic scientists do. You're sure to like this first game I planned for you!

Mr. Mugg

Vocabulary

Data: information, often in written form.

Forensic scientist: any type of scientist who can supply information that can be used in court or in a legal manner. For example, forensic anthropologists recover and study skeletons so the skeletons can be identified.

Observation: to study something using your five senses (sight, hearing, taste, touch and smell).

Properties: descriptive characteristics such as color, texture, shape and size.

Activity 1: What's in the Bag?

15 minutes

1. Ask students to write their names where indicated on their book covers.
2. Read "Notes for the Students" aloud while students follow along in their books.
3. Review the properties listed on the chart in "Activity 1: What's in the Bag?" in their books. Ask students to name examples of descriptive words that might appear under each property. For example, "smooth" or "rough" might appear under "Texture." Discuss the importance of safety when observing. Tasting and smelling can be dangerous with unknown objects or substances. While these objects pose no danger, others could give off fumes that are poisonous.
4. Instruct each pair to take one paper bag from where they are arranged or stored. **They are not to open it!**
   - ➔ Pairs should spread out around the room, so they cannot be seen by any other pairs.
   - ➔ In each pair, one person is "the observer" and the other is "the recorder." The pair will then switch jobs so that each student will have a turn doing both.
   - ➔ "The observer" puts one hand in the bag, feels the object, and describes it to "the recorder," naming shape and texture properties. Encourage them to take a guess at what the object might be!
   - ➔ "The recorder" lists these observations in the chart provided in "Activity 1: What's in the Bag?"
   - ➔ Have the observer remove the object from the bag and continue making observations using sight, smell, and hearing properties. Invite the students to use magnifiers and rulers from the supply area. Remind students that smelling needs to be done carefully and gently—and no tasting!
5. Instruct student pairs to return the object to their bag and fold down the flap.
6. Have pairs switch paper bags and "observer"/"recorder" roles, then follow the same process.
7. Instruct students to return objects to paper bags.
8. Ask several students to share what they discovered.

Activity 2: Describing Coins

15 minutes

1. Read the following from Mr. Mugg while students follow along in their books:

> I am sure that you are doing a fantastic job learning about making observations and recording data. The next activity involves describing coins. It might not be as easy as the previous activity, but now you will have a chance to put your observation and data skills to the test. Use the tools you need, including your senses and drawing skills, to help you with your observations.

2. Tell pairs they will use the chart in "Activity 2: Describing Coins!" and the supplies provided to make written observations of at least one coin.
   - ➔ Have each pair pick one coin from their cup and observe it carefully, using their magnifiers and rulers.
   - ➔ Both students should record the same information in the chart in "Activity 2: Describing Coins!"

- Coins should be returned to the cup after information is recorded.
- Pairs may make observations of additional coins in the chart provided in their books until other students are finished.

3. Instruct each pair to exchange their books and cups of coins with another pair.
   - Using each others' written data, students should try to identify the correct coin.
   - Once pairs believe they have identified the correct coin, they should check with the other pair.
4. Ask students to return each activity book to its owner.

Wrap-up

5–10 minutes

1. Ask: What do we know about observations? Responses will vary:
   - use your senses
   - senses are: sight, hearing, smell, and touch
   - observations can be recorded in a list or table
   - tasting may not be safe
   - sometimes it is hard to identify something just from written information
   - some properties are: color, texture, size, shape

Encourage students to add to what others have said. For example, if someone says that the five senses are used, then ask what the five senses are. Help students share anything they learned today. Encourage them to look through their books to refresh their memories.

2. Ask and answer any questions they may have.
3. Instruct students to record their observations, findings, or suspicions in the Case Notes section at the end of the Student Books.

Clean-up

5 minutes

1. Have students return all materials.
2. Check the floor for any stray books, materials or pencils. Return all materials to suitcase boxes.

Other Directions, Discussions and Destinations

The following activities and websites will enrich this lesson about observation and the five senses.

1. Using only your memory, try drawing a map of your bedroom. Take it home and check your work.
2. Pair up with a friend and observe each other for 30 seconds. Then go into separate rooms and list observations about your partner. Meet again and check to see how accurate you each were.
3. Check out The Kid's Page created by the FBI at **https://www.fbi.gov/how-we-can-help-you/students**. This page has information on the history of the FBI, safety, and various breeds of "working dogs," as well as games.
4. Visit Questacon, Australia's national science and technology center at **https://visitcanberra.com.au/attractions/56b23b6fb042386245d42ff8/questacon-the-national-science-and-technology-centre**.

Lesson 1

Activity 1: What's in the Bag?

Directions:

1. In pairs, take a paper bag. **Do not open it!**
2. Spread out around the room, so you cannot be seen by any other pairs.
3. One person is the **observer** and the other is the **recorder**. Jobs will switch, so you will each have a turn doing both.
4. Observer puts one hand in the bag, feels the object and describes it to the recorder (in a low voice) using properties such as shape and texture. Taking a guess here at what the object is might be fun!
5. Recorder lists these observations below. **Make sure to record the bag number!**
6. Observer removes the object from the bag and continues with observations using sight, smell and hearing: no tasting and be careful smelling. Magnifiers and rulers are available for use.
7. Return item to paper bag.
8. Switch paper bags with another pair.
9. Switch observer/recorder roles with each other.
10. Repeat steps 4–7.

Properties	Bag # _____	Bag # _____	Bag # _____
Shape			
Texture			
Size			
Color			
Odor			
Sound			

Lesson 1

Activity 2: Describing Coins!

I am sure that you are doing a fantastic job learning about observations and recording data. The next activity has to do with describing coins. It might not be as easy as the previous activity, but now you will have a chance to put your observation and data skills to the test. Remember, you may use a ruler and magnifier to help you with your observations.

Directions:

1. Pick a coin from the cup and observe it carefully. Feel free to use the magnifiers and rulers.
2. Record your observations below. Make sure to return the coin when you are done.

	Coin #1	Coin #2	Coin #3
Color Is it one color, many colors? Are the outer edges a different color than the top & bottom?			
Texture How does it feel? Smooth, bumpy? Do the outer edges feel different from the top & bottom?			
Shape Is it round? Does it have angles?			
Size Use the ruler!			
Image Use the magnifier! Look at the edges, top and bottom.			
Make a drawing of the coin			

Notes

Lesson 1

Figuring Out Forensics

organization and observation

Background

Dear Students,

I want to begin by thanking you very much for your willingness to help me solve the mystery of the missing geocaching trip money. Not only are you great problem solvers and observers, according to your instructor, but you're far away from where the crime took place. This makes you the perfect candidates to help get to the bottom of this crime. Inside this box I sent, you will find various clues and tools: bags of evidence, photographs, supplies for forensic testing, and notes that contain both factual scientific information as well as my own personal commentary on what I am learning about the crime that took place in my classroom at Markwell Elementary.

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Mr. Mugg

My Notes:

Activity 1: What's in the Bag?

Directions:

1. In pairs, take a paper bag. **Do not open it!**
2. Spread out around the room, so you cannot be seen by any other pairs.
3. One person is the **observer** and the other is the **recorder**. Jobs will switch, so you will each have a turn doing both.
4. Observer puts one hand in the bag, feels the object and describes it to the recorder (in a low voice) using properties such as shape and texture. Taking a guess here at what the object is might be fun!
5. Recorder lists these observations below. **Make sure to record the bag number!**
6. Observer removes the object from the bag and continues with observations using sight, smell and hearing: no tasting and be careful smelling. Magnifiers and rulers are available for use.
7. Return item to paper bag.
8. Switch paper bags with another pair.
9. Switch observer/recorder roles with each other.
10. Repeat steps 4–7.

Properties	Bag # _____	Bag # _____	Bag # _____
Shape			
Texture			
Size			
Color			
Odor			
Sound			

Activity 2: Describing Coins!

I am sure that you are doing a fantastic job learning about observations and recording data. The next activity has to do with describing coins. It might not be as easy as the previous activity, but now you will have a chance to put your observation and data skills to the test. Remember, you may use a ruler and magnifier to help you with your observations.

Directions:

1. Pick a coin from the cup and observe it carefully. Feel free to use the magnifiers and rulers.
2. Record your observations below. Make sure to return the coin when you are done.

	Coin #1	Coin #2	Coin #3
Color Is it one color, many colors? Are the outer edges a different color than the top & bottom?			
Texture How does it feel? Smooth, bumpy? Do the outer edges feel different from the top & bottom?			
Shape Is it round? Does it have angles?			
Size Use the ruler!			
Image Use the magnifier! Look at the edges, top and bottom.			
Make a drawing of the coin			

Glossary

Aerial view: The view looking down on something from above, like from an airplane.

Artificial: Man-made; not natural.

Cheiloscopy: The study of lip prints. Cheilo is Greek for lip.

Chemist: A person who examines what things are made of and how they change.

Class evidence: Evidence that cannot positively identify someone, such as shoe prints, since lots of people wear the same kind of shoes. Other examples: blood type, soil and glass.

Clay soil: Soil that is mostly clay, a little sand and humus. Not good for growing.

Cryptogram: A message written in code.

Crystal: A shape that is colorless and see-through. Might appear to have edges and points.

Data: Information, often in written form.

Decode: To translate a code into an understandable message.

DNA: Deoxyribonucleic Acid. It determines who you are.

DNA profile: A technique used by forensic scientists to assist in the identification of individuals by the unique arrangement of their DNA.

Electrophoresis: The use of electricity to separate DNA into bands.

Electrostatic wand: A wand that carries a positive electrostatic charge allowing it to "lift" dust from paper to provide a map of any indented impressions in that paper.

Encode: To change a message into code.

Fiber: Long, skinny thread used to make fabric.

Fixed points: Locations in a room that are always in the same place, like windows or corners. In a crime scene sketch, these help when drawing to scale.

Forensic geologist: A scientist who examines soil samples in a criminal investigation and determines their sources.

Forensic scientist: Any type of scientist who can supply information that can be used in court or in a legal manner. For example, forensic anthropologists recover and study skeletons so they can be identified.

Gel box: The equipment used to run the electrophoresis and get the DNA profile.

Genetic: Whatever you might inherit from your parents.

Humus: Dead plant or animal material that makes soil fertile.

Interrogate: To rigorously question suspects thought to be guilty of a crime.

Interview: To collect information from people during a criminal investigation.

Latent shoe print: A present but invisible, or nearly invisible, print.

Loam: Soil that contains the right amounts of gravel, sand and clay. It also includes a great deal of humus, so it is good for growing. Usually dark brown or black.

Magnetic powder: Fine powder used by crime scene investigators in dusting for shoe prints and other prints. Magnetic powder develops latent prints very well.

Means: A way or an ability to commit a crime or perform an action. Answers the question: **how?** For example, a car was spray painted with graffiti, and a can of the same paint was found on the suspect.

Mock crime scene: A pretend crime scene that is invented for the sake of instruction or as a game.

Motive: A reason to commit a crime or perform another action. Answers the question: **why?** For example, someone was starving so he or she stole food.

Natural: Not man-made. Derived from animals, plants, or minerals.

Observation: To study something using your five senses (seeing, hearing, tasting, touching and smelling.)

Opaque: Not allowing light to pass through.

Opportunity: The chance or ability to commit a crime at a given place and time. Answers the questions: **when** and **how?** For example, a crime was committed at 3 p.m. and Josie was walking her dog at the location of the scene of the crime at 3 p.m.

Physical evidence: Evidence that is part of an object or thing, and shows that a crime has been committed. Examples: weapons, handwriting and carpet.

Properties: Descriptive characteristics such as color, texture, shape and size.

Pyrolysis: Heat test to help identify fibers.

Reaction: A change.

Sandy soil: Soil that is mostly sand, a little clay and no humus. Not good for growing.

Solution: Made when a substance dissolves and the reaction forms a liquid.

Suspect Statement: A written or recorded response to questions from investigators by a suspect about a crime.

Suspension: Made when a substance does not completely dissolve; liquid and powder remain separate. Oil and water, for example, is a suspension.

Synthetic: Made by humans; artificial.

Toxicologist: Person who tests body fluids, such as saliva, or organs, like lungs, for the presence of drugs, alcohol or poison.

Trace evidence: Small amounts of evidence, such as soil or glass, that could connect a suspect to the crime.

Translucent: Not completely clear, but clear enough to allow light to pass through.

Tread: Raised design on the tire itself.

Triangulation: Most accurate way of showing the location of evidence at the crime scene. A triangle is created using the evidence and two fixed points.

Unique evidence: Evidence that tends to identify one particular person, such as fingerprints.

Vertical: Going up and down.

Appendix

Missing Money Mystery Standards Matrix

Missing Money Mystery is a 10-lesson program that helps learners meet the Next Generation Science Standards and the Common Core State Standards (CCSS)

Ideally suited for learners in grades 3-5, *Missing Money Mystery* meets many of the practices, cross-cutting concepts, and disciplinary core ideas that comprise the Next Generation Science Standards. The practices, concepts, and disciplinary ideas specifically covered in this unit include:

PRACTICES:

- Asking Questions and Defining Problems
  - ➛ Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.

- Planning and Carrying Out Investigations
  - ➛ Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.
  - ➛ Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.
  - ➛ Conduct an investigation to produce data to serve as the basis for evidence that can meet the goals of the investigation.

- Analyzing and Interpreting Data
  - ➛ Analyze and interpret data to determine similarities and differences in findings.

- Engaging in Argument from Evidence
  - ➛ Support an argument with evidence, data, or a model.

- Scientific Knowledge is Based on Empirical Evidence
  - ➛ Science knowledge is based upon logical and conceptual connections between evidence and explanations.
  - ➛ Science disciplines share common rules of obtaining and evaluating empirical evidence.

CROSS CUTTING CONCEPTS:

- Patterns
  - ➛ Patterns can be used to identify cause-and-effect relationships.
  - ➛ Graphs, charts, and images can be used to identify patterns in data.

DISCIPLINARY CORE IDEAS:

- PS1.A: Structure and Properties of Matter
  - ➛ Measurements of a variety of properties can be used to identify materials

- LS3.B: Variation of Traits
  - ➛ In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.

In addition to aligning to the underlying concepts that comprise the Next Generation Science Standards (NGSS), this unit meets Common Core Learning Standards (CCLS) in Mathematics and English Language Arts and Literacy in grades 3-5. Specific CCLS addressed include:

- CCSS.ELA-Literacy.CCRA.SL.1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their

own clearly and persuasively.

- CCSS.ELA-Literacy.CCRA.SL.2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
- CCSS.ELA-Literacy.CCRA.SL.4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
- CCSS.ELA-Literacy.CCRA.R.1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- CCSS.ELA-LITERACY.CCRA.R.3: Analyze how and why individuals, events, or ideas develop and interact over the course of a text.
- CCSS.Math.Content.3.MD.B.3: Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.
- CCSS.Math.Content.3.MD.B.4: Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

Standard	Lesson											
	1	2	3	4	5	6	7	8	9	10	11	12
Next Generation Science Standards												
Practice: Asking Questions and Defining Problems	*	*	*	*	*	*			*	*		
Practice: Planning and Carrying Out Investigations	*	*	*	*	*	*	*		*	*		
Practice: Analyzing and Interpreting Data				*			*				*	*
Practice: Engaging in Argument from Evidence		*	*	*	*	*	*		*	*	*	*
Practice: Scientific Knowledge is Based on Empirical Evidence	*	*	*	*	*	*			*	*		
Cross-Cutting Concept: Patterns					*				*			
Disciplinary Core Idea: PS1.A: Structure and Properties of Matter			*			*						
Disciplinary Core Idea: LS3.B: Variation of Traits										*		
Common Core State Standards												
CCSS.ELA-Literacy.CCRA.SL.1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.	*	*	*	*	*	*	*	*	*	*	*	*
CCSS.ELA-Literacy.CCRA.SL.2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.		*	*	*	*	*	*	*	*	*	*	*
CCSS.ELA-Literacy.CCRA.SL.4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.							*				*	*
CCSS.ELA-Literacy.CCRA.R.1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.											*	*
CCSS.ELA-LITERACY.CCRA.R.3: Analyze how and why individuals, events, or ideas develop and interact over the course of a text.	*	*	*	*	*	*	*	*	*	*	*	*
CCSS.Math.Content.3.MD.B.3: Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.									*			
CCSS.Math.Content.3.MD.B.4: Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.	*	*			*		*					

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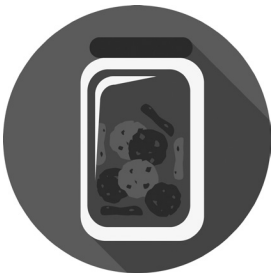

Cookie Jar Mystery:

A Study in Forensic Science for Grades 4-5

Science Fair Mystery:

A Deceitful Display Adventure for Grades 6-7

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