

Unit Summary

The Curriculum Guide includes

- > Comprehensive, unit specific, teacher and student guides.
- > Materials list, Comprehensive glossary, Science safety, How to keep a laboratory notebook, and How to collect, organize, understand, analyze, and record data sections.
- > Comprehensive Appendix covering digital imaging and microtechnique.

Summary

These standards-based units link to core science concepts, making them an excellent complement to your existing curriculum. Best of all, you won't need a deep background in science to use this program – the comprehensive Curriculum Guide included with the module provides teacher-friendly instructions on how to present the skill activities and conduct the case investigations.

Unit 1: Fingerprint Evidence

Concepts and Skills

- Scientific method
- Experimental design
- Interpreting data
- Skin structure
- Fingerprinting
- Analytical thinking
- Observation
- Drawing conclusions

Skill Learning Activities

In Activity 1, students will learn how to take direct or known (K), fingerprints using a revolutionary inkless process. They will continue Sir Francis Galton's methods to create a class database of thumbprints for use in future case investigations.

In Activity 2, students will gain practice in identifying both the ridge pattern category (arch, loop, and whorl) and additional fingerprint ridge details.

In Activity 3, students will classify a collection of thumbprints by ridge category (loop, arch, and whorl).

In Activity 4, students will attempt to lift a latent thumbprint of an unknown classmate from both a transparent glass surface using black graphite, and a black, opaque, smooth surface using talc. They will then compare their data to a database of known class member thumbprints.

In Activity 5, students, using ninhydrin, will attempt to image, recover, and identify a latent fingerprint.

In Activity 6, students will use the chemical reaction of cyanoacrylate vapors (in a warm environment) with the moisture in a fingerprint to image the fingerprint.

Case Activities

In Case Activity 1, students will attempt to find and image a latent fingerprint, recover it, and identify its source.

In Case Activity 2, students try to determine if two evidence fingerprints recovered from a glass window are both latent fingerprints.

In Case Activity 3, using collected evidence, students will try to determine if a direct match can be made from the recovered latent fingerprint.

In Case Activity 4, students will plan a strategy concerning how best to process the evidence, record factual information about the evidence, and analyze the results.

In Case Activity 5, students will try to determine if a positive identification can be made and calculate their confidence in the accuracy of their findings.

Suggested *Going Further investigations* allow students to determine how latent fingerprints are made; whether latent fingerprints improve with age; can an individual not leave fingerprints without gloves; examining photocopies of fingerprints; making fingerprint impression.

Unit 2: DNA Evidence

Concepts and Skills

- Scientific method
- Experimental design
- Probability analysis
- Genetic principles of inheritance
- DNA and its structure
- RFLP / STR analysis
- Analytical thinking
- Observation
- Drawing conclusions

Skill Learning Activities

In Activity 1, your students will simulate how DNA VNTR probes cut DNA into small fragments at specific sites. They will also learn that the distances of these sites vary in each individual, so the lengths of the cut fragments, called Restriction Fragment Length Polymorphisms (RFLP's) also vary.

In Activity 2, students will electrophorese a set of simulated PCR-amplified DNA samples to confirm an initial lab finding that links a suspect to a crime scene.

In Activity 3, students will learn how to interpret an actual DNA profile (autoradiogram) and identify the suspect in a case.

In Activity 4, students will review and analyze STR data to determine which of the suspects left physical DNA evidence at the crime scene.

In Activity 5, students will learn how to calculate the probability that a single individual can be placed at the crime scene, to the exclusion of all others.

In Activity 6, students will review DNA profiles and provide an expert opinion to the County Coroner's office so that a Death Certificate can be issued.

Case Activities

In Case Activity 1, after reviewing DNA profiles, students will attempt to determine which man is the biological father of a new born male son.

In Case Activity 2, students will review the analysis and confirm the case investigator's findings for the Clay County Court. Did Jesse James fake his death?

In Case Activity 3, students will conduct a VNTR analysis of DNA profiles.

In Case Activity 4, students will consult on the re-examination of the RFLP DNA profiles of the Romanov family to compare and evaluate DNA fingerprint patterns to establish family relationships.

Suggested *Going Further investigations* provide students with additional challenges. They suggest critically reviewing episodes of CSI for scientific accuracy and learning more about genetic analysis instrumentation.

Unit 3: Blood Evidence

Concepts and Skills

- Scientific method
- Experimental design
- ABO Rh blood groups
- Antibody – antigen reaction
- Blood cells
- Analytical thinking
- Observation
- Drawing conclusions

Skill Learning Activities

In Activity 1, students will attempt to determine if a stain is animal blood.

In Activity 2, students learn how to apply a precipitin test for human antibodies.

In Activity 3, students will identify a human blood group.

In Activity 4, students learn about the sensitivity of luminol and its application in detecting evidence.

In Activity 5, students will construct a series of reference cards that illustrate how a drop of blood is altered by the impact angle, the height of fall, and the contact surface.

Case Activities

In Case Activity 1, students attempt to determine whether a stain is human blood.

In Case Activity 2, students will examine evidence to determine if it contains multiple quantities of blood.

In Case Activity 3, students learn if a forensic test can have two meanings.

In Case Activity 4, students will determine the blood type(s) present on physical evidence recovered from a crime scene.

In Case Activity 5, students will determine the fall height of a blood drop.

Suggested *Going Further investigations* further explore serological tests and false positives; proteins and heat; calculating the speed of falling blood drops.

Unit 4: Trace Evidence – Particles, _____ Fibers, and Marks

Concepts and Skills:

- Scientific method
- Experimental design
- Locard's principle
- Paint chip analysis
- Microscopy / optics
- Transmitted, reflected, polarized light
- Hair and fiber analysis
- Density analysis
- Analytical thinking
- Observation
- Drawing conclusions

Skill Learning Activities

In Activity 1, students will create a reference collection of known examples of hair and fiber types that can be used as known standards (K) to compare against future questioned samples.

In Activity 2, students will learn how to cast impressions and match them to a known impression imprint.

In Activity 3, students learn how to use Locard's exchange principle and let the recovered evidence tell a story about where a white t-shirt has been.

In Activity 4, students will learn how to set up a paint chip for microscopic examination and determine if an extra layer – over painting – has occurred.

In Activity 5, students will learn how to identify various fabrics and weave patterns.

Case Activities

In Case Activity 1, students will attempt to solve a commercial fraud case by determining which impounded artist brush is the authentic Kolinsky sable hair.

In Case Activity 2, students will attempt to determine if particles recovered from the tread of the shoes from two suspects can place either at the scene of the crime.

In Case Activity 3, students will perform a density analysis to determine if a match can be made between plastic and glass fragments recovered from the victim and a suspect vehicle.

In Case Activity 4, students will read the background case information and try to determine if the physical evidence agrees with the sworn testimony presented.

In Case Activity 5, students will determine the fiber composition of an absorbent material used for medical testing.

Suggested *Going Further investigations* provide students with an opportunity to examine Locard's Principle; determine how long does transferred evidence persist; analyze impressions; determine whether all soda lime glass is the same; find out what's in a paint job.

Unit 5: Questioned Document Evidence

Concepts and Skills

- Scientific method
- Experimental design
- Chromatography (ink analysis)
- Transmitted & reflected light
- Handwriting analysis
- Paper analysis
- Analytical thinking
- Observation
- Drawing conclusions

Skill Learning Activities

In Activity 1, students will learn the steps in paper analysis.

In Activity 2, students will learn how handwriting analysts analyze handwriting to determine similarities or dissimilarities.

In Activity 3, students will learn the forensic techniques of detecting an altered document.

In Activity 4, students will learn how to make a chromatographic investigation of various writing inks.

Case Activities

In Case Activity 1, students will examine signatures and attempt to determine if one is forged.

In Case Activity 2, students will attempt to authenticate a document using an analysis of the writing inks.

In Case Activity 3, students will perform a forensic examination of a lottery ticket to validate its authenticity.

In Case Activity 4, students will perform a handwriting analysis of several known (K) documents and make a comparison to two questioned (Q) documents.

In Case Activity 5, each student team will perform an analysis of the submitted document to determine if it is an authentic Poe document.

Suggested *Going Further investigations* further explore color and photocopying; typography; forgery by photocopying; investigating UV light; investigating inks.

Unit 6: The Case of the Silent Sentinel

Concepts and Skills

- Scientific method
- Experimental design
- Chromatography (ink analysis)
- Toxicological Analysis
- Handwriting analysis
- Fingerprint analysis
- Blood analysis
- Observation
- Drawing conclusions

Student investigative teams are confronted with a crime scene: a dead body, a suicide note, a bottle of poison, a pen, and assorted fingerprint and blood stains. Did a wrongful death occur? Who is the most likely the suspect? Can student investigators obtain a Grand Jury indictment?

Skill Learning Activities

In Activity 1, students will use a specially prepared test strip that provides a color change to indicate the presence of a particular group of poisonous substances when testing two substances.

In Activity 2, using chromatography students will identify substances by comparing their Rf value to a known standard.

In Activity 3, students will learn how to compare an unknown fingerprint with that of a fingerprint of a known identity to establish a direct match.

In Activity 4, students will attempt to determine if the suicide note is in the victim's own hand.

In Activity 5, students are challenged to determine the blood groups of the blood sample recovered at the scene.