

Fingerprints

Content Area: **Science**
Course(s): **CP Forensics**
Time Period: **Marking Period 3**
Length: **3 weeks**
Status: **Published**

Course Pacing Guide

	Unit	MP	Weeks
Fingerprints		3	3

Unit Overview

In this unit, students learn how and when fingerprints are formed. They also learn the structure and classification of different types of fingerprints. They then learn about individual ridge characteristics that make each fingerprint unique. Students are then taught several different techniques for lifting fingerprints for collection and comparison purposes.

Enduring Understandings

Students will be able to lift, identify and compare fingerprints in order to make a match.

Essential Questions

What are the different characteristics of a fingerprint?

What are the different classifications of a fingerprint?

How can you determine a match?

New Jersey Student Learning Standards (No CCS)

9-12.HS-ETS1-1.1.1	Analyze complex real-world problems by specifying criteria and constraints for successful solutions.
9-12.HS-ETS1-3.6.1	Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Amistad Integration

The Amistad Bill (A1301), which became law in 2002, calls on New Jersey schools to incorporate African-American history into their **social studies** curriculum.

This course does not fall in this category.

Holocaust/Genocide Education

a. Every board of education shall include instruction on the Holocaust and genocides **in an appropriate place in the curriculum** of all elementary and secondary school pupils.

This lesson does not fall in this category

Interdisciplinary Connections

VPA.1.1.12.C.CS2	Characters have physical, emotional, and social dimensions that can be communicated through the application of acting techniques.
VPA.1.3.12.C.CS2	Presentation of believable, multidimensional characters in scripted and improvised performances requires application of specific physical choices, sustained vocal technique, and clearly motivated actions.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
TECH.8.1.12.C.CS4	Contribute to project teams to produce original works or solve problems.

Technology Standards

TECH.8.1.12.B.CS2	Create original works as a means of personal or group expression.
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21st Century Themes/Careers

CAEP.9.2.12.C.3

Identify transferable career skills and design alternate career plans.

Financial Literacy Integration

1. The State Board of Education shall require that a school district incorporate in each of the **grades ¹[kindergarten] six¹ through eight** financial literacy instruction to pupils enrolled in those grades. The purpose of the instruction shall be to provide ¹[elementary and]¹middle school students with the basic financial literacy necessary for sound financial decision-making.

This course dose not fall in this range.

Instructional Strategies & Learning Activities

In this unit, students will go on a scavenger hunt throughout the school looking for and lifting fingerprints. They will also have to digitally upload these prints and identify the individualizing components of the print.

Fingerprint Analysis

Prior to all the advances in DNA testing, fingerprints were the primary means of personal identification. No two people have the same fingerprint patterns. Fingerprint analysis is often the first line of scientific inquiry on items of physical evidence and at the crime scene. Prints are formed by friction ridges that deposit oils and perspiration when fingers touch an object. They also may be formed when fingers are contaminated with blood or dirt or when fingers are pressed into a pliable material creating a negative of the fingerprint pattern.

Fingerprint Cards Preparation

Press one finger at a time on the ink pad (in a rolling motion), making sure that the fingerprint ridges are covered with a thin layer of ink. If you cannot see the fingerprint pattern through the ink, then you probably have too much ink on the finger. Take each inked finger and firmly press and roll in one direction (from left to right or right to left) onto a fingerprint card. Fingerprint cards will have blocked areas in which to place each finger. Once the ink dries, print your name and the date in the space provided on the fingerprint card.

The fingerprint cards will be used to create a file that each student will search to individualize unknown prints.

Latent Print Preparation

Produce 2 sets of latent prints on separate glass slides and aluminum strips. Before placing your fingers on each item, rub your fingers through your hair to ensure that enough oil is present on your fingertips. Firmly place 4 fingers of either your left or right hand on the items once only. Attach a sticker with your student ID# or other form of anonymous identification to the print. **Do not cover the print.** Give one set of latent prints on glass and aluminum to your teacher to serve as unknowns for other students.

Develop your latent fingerprints on glass using non-magnetic fingerprint powder and on aluminum using cyanoacrylate fuming.

Developing Latent Fingerprints with Non-magnetic Powder

1. Dip the tip of the bristles of a fingerprint dusting brush in the powder.
2. Using motion in one direction, gently brush across the area of the fingerprint

until you see the print beginning to appear. Continue brushing on the exposed

fingerprint. If necessary, use additional dusting powder. Once the ridges appear, the motion of the brush should follow the direction of the ridge flow.

3. When the print is clearly developed, stop brushing. Further development may easily destroy the print.

Lifting a Developed Latent Print with Transparent Tape

1. Pull off approximately 6-7 cm of transparent fingerprint lifting tape from the roll.

2. Place one end of the tape on the object approximately 3-6 cm from one end of the developed print. Cover the print with the tape by smoothing the tape over the print with your finger, beginning from the attached end and working slowly across the print. Avoid air bubbles. Air bubbles under the tape will partially ruin the lifted fingerprint. Extend the tape a few cm past the fingerprint on the object, leaving the end of the tape strip unattached.
3. Lift the tape from the unattached end smoothly from the surface of the object in one continuous, unbroken motion.
4. Place one end of the tape on a line-free index card of contrasting color to the fingerprint and attach the rest of the tape to the card. Again, smooth the tape over the card with your finger, avoiding air bubbles.
5. Initial and date the card. Also, put the name of the object and the type of surface where the print was lifted from on the card. Attach the card to the your notebook.

Development of Latent Prints on Aluminum using Super-Glue Fuming and Enhancement with Fingerprint Powder

1. In a developing chamber, place the aluminum object along with a small dish of water.
2. Place a few drops of Super Glue in the middle of a 6 inch x 6 inch (approximate size) sheet of aluminum foil and fold evenly.
3. Open the foil and immediately place in the chamber. Cover the chamber. If fuming does not occur, place the foil on a heating plate and gently heat inside the chamber.

4. Allow the Super Glue to fume until prints are developed on the object.

Remove the object from the chamber.

Testing of Unknowns

After you process your latent fingerprints using the two methods (non-magnetic fingerprint powder and cyanoacrylate fuming), and you feel comfortable with the techniques, sign out an unknown set. Each set will consist of a piece of glass and a piece of aluminum containing another student's latent fingerprints. Fill out a chain of custody form and give to your teacher.

You will process each item for latent fingerprints using the desired method for that item. Latent prints developed with powders can be lifted by placing a strip of clear adhesive tape evenly on the print, then removing the tap and adhering it to paper with color sufficient to provide a good contrast with the powdered print. You will then compare the latent fingerprint pattern with a set of exemplar fingerprint cards to determine which student is the origin of the set of latent prints.

Document the general pattern of the unknown fingerprints (plain loop, tented arch, etc.) and note three or four minutiae (individual ridge characteristics) that you feel will be useful in the search. Use a magnifier to see individual ridge characteristics. Sketch and label the selected minutiae in your notebook. Once this has been done, examine the file cards for the print matching your unknown. Narrow your search to those prints which match the general pattern of your unknown. Document the differences with each print that does not match the general pattern. For prints with the same general pattern, check for the combination of minutiae documented in the unknown. If more than one print match the selected minutiae, examine the unknown prints for additional minutiae and then compare with the narrowed group. Continue searching until you feel you have excluded all but one in the group. Do not conclude that you have a "match" unless sufficient points of comparison have been found to exclude all other prints, including the million others not in the class. Examiners use anywhere from 8 to 16 points of comparison (depending on jurisdiction) before declaring a "match".

Once you are convinced that a file card matches your unknown, justify the "match" by listing the matching points (use a minimum of 8) and their location. An enlarged annotated sketch of each print is necessary to support the justification.

Transfer custody of the evidence back over to the instructor when finished.

Ransom Note

Sign out a ransom note from your teacher, along with a set of exemplar prints from possible suspects.

Use a magnifying glass to document the general pattern of the unknown prints from the note and make annotated sketches in your notebook. Attach the ransom note to your notebook as well.

Now compare your unknown with the exemplars. Determine if you can find a possible “match”. Make an annotated sketch of your “match” print and the suspects name.

You should find at least 5 points of comparison.

Iodine Fuming

Take a piece of paper from your teacher and make a thumb impression on it. Handle the paper with forceps to avoid putting additional prints on it. You may wish to run your hand through you hair first to make sure it has sufficient oils on it.

Tape the thumb print to the underside of the lid to a mason jar.

Drop 2-3 iodine crystals into the jar and screw the lid on.

Place the jar somewhere warm and watch as the iodine vaporizes.

Once the print becomes visible on the paper you can remove it.

Spray with starch to fix the print and stick it in your notebook

Differentiated Instruction

- Curriculum Map
- Inquiry/Problem-Based Learning
- Learning preferences integration (visual, auditory, kinesthetic)
- Tiered Learning Targets
- Learning through play
- Relationship-Building & Team-Building
- Self-Directed Learning

- Debate
- Student Data Inventories
- Mastery Learning (feedback toward goal)
- Goal-Setting & Learning Contracts
- Grouping
- Rubrics
- Flipped Classroom
- Mentoring
- Assessment Design & Backwards Planning

Formative Assessments

Open ended questions asked during the lesson to gauge student understanding and address any misconceptions. Also, students will be practicing lifting prints by lifting their own prints.

Summative Assessment

Students will need to classify and identify characteristics on a print, and put together a digital portfolio of prints they collected.

Benchmark Assessments

There are no gradelevel standards for this class.

Alternate Assessments

Students will need to classify and identify characteristics on a print, and put together a digital portfolio of prints they collected.

Resources & Technology

Powerpoint and SMART Board presentations are used to introduce new material. Students also upload prints into a photo editing program to adjust the color and contrast so the print can be seen better, then in this same

digital platform identify and label several specific ridge characteristics.

BOE Approved Texts

Saferstein, Richard, 1941-. **Criminalistics : An Introduction to Forensic Science**. Upper Saddle River, NJ :Prentice Hall, 1998.

Closure

Students also upload prints into a photo editing program to adjust the color and contrast so the print can be seen better, then in this same digital platform identify and label several specific ridge characteristics.

ELL

- Teacher Modeling
- Group work
- Simplified Written and Verbal Instructions
- Google Translate

Special Education

- Specify and list exactly what the student will need to learn to pass.
- Evaluate the classroom structure against the student's needs (flexible structure, firm limits, etc.).
- Keep workspaces clear of unrelated materials.
- Reduce visual distractions in the classroom (mobiles, etc.).
- Provide a computer for written work.
- Seat the student close to the teacher or a positive role model.
- Provide an unobstructed view of the chalkboard, teacher, movie screen, etc.
- Keep extra supplies of classroom materials (pencils, books) on hand.
- Maintain adequate space between desks.
- Give directions in small steps and in as few words as possible.
- Number and sequence the steps in a task.
- Have student repeat the directions for a task.
- Provide visual aids.
- Go over directions orally.
- Allow the student to complete an independent project as an alternative test.
- Grade spelling separately from content.

- Show a model of the end product of directions (e.g., a completed math problem or finished quiz).
- Stand near the student when giving directions or presenting a lesson.

504

- preferential seating
- extended time on tests and assignments
- modified textbooks or audio-video materials
- behavior management support
- excused lateness, absence, or missed classwork

At Risk

- Have student restate information
- Provision of notes or outlines
- Concrete examples
- Assistance in maintaining uncluttered space
- No penalty for spelling errors or sloppy handwriting
- Follow a routine/schedule
- Teach time management skills
- Verbal and visual cues regarding directions and staying on task
- Visual daily schedule
- Immediate feedback
- Work-in-progress check
- Pace long-term projects
- Cue/model expected behavior
- Use de-escalating strategies
- Use peer supports and mentoring
- Chart progress and maintain data

Gifted and Talented

Focus on effort and practice

Offer the Most Difficult First

Offer choice

Speak to Student Interests

Allow G/T students to work together

Encourage risk taking